FCC RADIO TEST REPORT

According to

47 CFR FCC Part 15 Subpart C § 15.247

Equipment	:	**802.11abgn, USB module**
Brand Name	:	**SparkLAN**
Model No.	:	**WUBR-508N**
Filing Type	:	**New Application**
Applicant **Manufacturer**	:	**SparkLAN Communications, Inc.** 8F., No. 257, Sec. 2, Tiding Blvd., Neihu District, Taipei City 11493, Taiwan
FCC ID	:	**RYK-WUBR508N**
Received Date	:	Mar. 29, 2012
Final Test Date	:	May 14, 2012

Statement

Test result included in this report is only for printed antenna (802.11a/n Band 4) of the product.

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.4-2003** and **47 CFR FCC Part 15 Subpart C**.

The test equipment used to perform the test is calibrated and traceable to NML/ROC.

Testing Laboratory
1190

SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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History of This Test Report

Original Issue Date: May 15, 2012
Report No.: FR232843AI
■ No additional attachment.
□ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

According to

47 CFR FCC Part 15 Subpart C § 15.247

Equipment	:	802.11abgn, USB module
Brand Name	:	SparkLAN
Model No.	:	WUBR-508N
Applicant	:	SparkLAN Communications, Inc. 8F., No. 257, Sec. 2, Tiding Blvd., Neihu District, Taipei City 11493, Taiwan

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Mar. 29, 2012 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

Wayne Hsu / Assistant Manager

SPORTON International Inc.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

1 SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
3.1	15.207	AC Power Line Conducted Emissions	Complies	15.62 dB
3.2	15.247(b)(3)	Maximum Peak Output Power	Complies	5.04 dB
3.3	15.247(e)	Power Spectral Density	Complies	18.35 dB
3.4	15.247(a)(2)	6dB Spectrum Bandwidth Measurement	Complies	-
3.5	15.247(d)	Radiated Emissions	Complies	1.13 dB
3.6	15.247(d)	Band Edge and Fundamental Emissions	Complies	-
3.7	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Peak Output Power	±0.8dB	Confidence levels of 95%
Power Spectral Density	±0.5dB	Confidence levels of 95%
6dB Spectrum Bandwidth Measurement	$\pm 8.5\times10^{-8}$	Confidence levels of 95%
Radiated Emissions (9kHz~30MHz)	±0.8dB	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	±1.9dB	Confidence levels of 95%
Radiated / Band Edge Emissions (1GHz~18GHz)	±1.9dB	Confidence levels of 95%
Radiated Emissions (18GHz~40GHz)	±1.9dB	Confidence levels of 95%
Temperature	±0.7℃	Confidence levels of 95%
Humidity	±3.2%	Confidence levels of 95%
DC / AC Power Source	±1.4%	Confidence levels of 95%

2 GENERAL INFORMATION

2.1 Product Details

There are three types of the EUT. The difference between these three types is connector; we chose the full function type to test. Only the radio detail of IEEE 802.11a/n is shown in this report. For more detailed features description, please refer to the manufacturer's specifications or user's manual.

Items	Description
Power Type	From system
Data Modulation Data Rate (Mbps)	OFDM for IEEE 802.11a (BPSK / QPSK / 16QAM / 64QAM) (6/9/12/18/24/36/48/54) See the below table for IEEE 802.11n
Frequency Range	5725 ~ 5850MHz
Channel Number	5 for 20MHz bandwidth ; 2 for 40MHz bandwidth
Channel Band Width (99%)	802.11a : 16.40 MHz
	802.11n : MCS 8 (20MHz) : 17.52 MHz ; MCS 8 (40MHz) : 36.08 MHz
Conducted Output Power	802.11a : 20.29 dBm
	802.11n : MCS 8 (20MHz) : 24.32 dBm ; MCS 8 (40MHz) : 22.34 dBm

IEEE 802.11n Modulation Scheme

MCS	Spatial	Modulation	Coding Rate	Data rate(Mbps)	
Index	Streams	Type	Type	20 MHz channel	40 MHz channel
				800nsGI	800nsGI
0	1	BPSK	1/2	6.5	13.5
1	1	QPSK	1/2	13	27
2	1	QPSK	3/4	19.5	40.5
3	1	16-QAM	1/2	26	54
4	1	16-QAM	3/4	39	81
5	1	64-QAM	2/3	52	108
6	1	64-QAM	3/4	58.5	121.5
7	1	64-QAM	5/6	65	135
8	2	BPSK	1/2	13	27
9	2	QPSK	1/2	26	54
10	2	QPSK	3/4	39	81
11	2	16-QAM	1/2	52	108
12	2	16-QAM	3/4	78	162
13	2	64-QAM	2/3	104	216
14	2	64-QAM	3/4	117	243
15	2	64-QAM	5/6	130	270

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bits per single carrier
NCBPS	Number of coded bits per symbol
NDBPS	Number of data bits per symbol
GI	guard interval

2.2 Table for Filed Antenna

Antenna Category (Ant. Cat.)	
☒	Integral antenna (antenna permanently attached)
☒	Temporary RF connector provided

Transmitter Outputs & Receiver Inputs Information			
Modulation	**Transmitter Outputs**	**Receiver Inputs**	**Transmitter Output Signals**
802.11a	1	1	-
802.11n HT20 / HT40	2	2	-

Antenna General Information									
Antenna Port (Total 2 Port)		1(TX/RX), 2(TX/RX)							
Maximum RF Output Power Level (PL)		1							
Transmit Chains Power Distribution		☒ symmetrical distribution ☐ asymmetrical distribution							
Ant. No.	**PL**	**Ant. Port** [Ant No. *X* connect to Ant. Port *Y*]	**Ant. Cat.**	**Ant. Type**	**Brand**	**Model**	**G_{ANT}** (dBi)	**DG (dBi)** [correlated] **N_{TX} = 1**	**DG (dBi)** [uncorrelated] **N_{TX} = 2**
1	1	1	Internal	Printed	SparkLAN	WUBR-508N	6.64	N/A	6.64
	1	2	Internal	Printed	SparkLAN	WUBR-508N	6.64		
☒	EUT is consist of multiple antenna models assembly (multiple antenna models are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type. Then Ant. No. 1 shall be performed the radiated test.								
☒	The equipment is normally installed and point-to-point or point-to-multipoint systems: Ant. No. 1								

Note 1: For all transmitter outputs with equal antenna gains, directional gain is to be computed as follows:
Any transmit signals are correlated, Directional Gain (DG) = G_{ANT} + 10 log(N) dBi
All transmit signals are completely uncorrelated, Directional Gain (DG)= G_{ANT}

Note 2: For all transmitter outputs with unequal antenna gains, directional gain is to be computed as follows:
Any transmit signals are correlated, Directional Gain (DG) =
$10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N]$ dBi
All transmit signals are completely uncorrelated, Directional Gain (DG) =
$10 \log[(10^{G1/10} + 10^{G2/10} + \ldots + 10^{GN/10)/N}]$ dBi

**The EUT was pre-tested antenna port 1 and antenna port 2 for single chain, the worst case was antenna port 2. therefore only the test data recorded in this report.

2.3 Table for Carrier Frequencies

Frequency Band	Channel No.	Frequency (20MHz)	Channel No.	Frequency (40MHz)
5725~5850 MHz	149	5745 MHz	151	5755 MHz
	153	5765 MHz	159	5795 MHz
	157	5785 MHz	-	-
	161	5805 MHz	-	-
	165	5825 MHz	-	-

2.4 Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on the entire possible configuration for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Channel
AC Power Line Conducted Emissions Radiated Emissions Below 1GHz	System Mode	-	-
Maximum Peak Output Power Power Spectral Density	11a/BPSK	6 Mbps	149/157/165
	MCS 8 (20MHz)	13Mbps	149/157/165
	MCS 8 (40MHz)	27Mbps	151/159
6dB Spectrum Bandwidth 99% Occupied Bandwidth	11a/BPSK	6 Mbps	149/157/165
	MCS 8 (20MHz)	13Mbps	149/157/165
	MCS 8 (40MHz)	27Mbps	151/159
Radiated Emissions Above 1GHz Fundamental Emissions	11a/BPSK	6 Mbps	149/157/165
	MCS 8 (20MHz)	13Mbps	149/157/165
	MCS 8 (40MHz)	27Mbps	151/159
Band Edge Emissions	11a/BPSK	6 Mbps	149/165
	MCS 8 (20MHz)	13Mbps	149/165
	MCS 8 (40MHz)	27Mbps	151/159

2.5 Table for Testing Locations

Test Site No.	Site Category	Location
CO01-HY	Conduction	Hwa Ya
TH01-HY	OVEN Room	Hwa Ya
03CH02-HY	SAC	Hwa Ya

Semi Anechoic Chamber (SAC).

2.6 Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Notebook	DELL	VOSTRO 3350	DoC
(USB) Mouse	Microsoft	1113	JNZ211443
iPod nano	Apple	A1199	N/A
Wireless AP (Remote Workstation)	D-Link	DNS-G120	DoC

2.7 Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

For Single Chain:
Power Parameters of IEEE 802.11a Port 2

Test Software Version	RT 5x7x QA		
Frequency	5745 MHz	5785 MHz	5825 MHz
IEEE 802.11a	1B	1E	1B

For Two Chains:
Power Parameters of IEEE 802.11n Port 1 + Port 2

Test Software Version	RT 5x7x QA		
Frequency	5745 MHz	5785 MHz	5825 MHz
IEEE 802.11n (20MHz)	2B:2B	2B:2B	2B:2B
Frequency	5755 MHz	5795 MHz	-
IEEE 802.11n (40MHz)	2B:2B	2B:2B	-

2.8 EUT Operation during Test

Conducted emissions and radiated emissions 9kHz~1GHz

Two executive programs, "EMITEST.exe" and "EMCTEST.exe" under Win XP, which generates a complete line of continuously repeating "H" pattern was used as the test software.

The program was executed as follows:

a. Turn on the power of all equipment.

b. The NB executed "Winthrax.exe" to read/write data from EUT.

c. The NB executed " EMITEST.exe " sends “H” messages to the panel and displays “H” patterns on the screen.

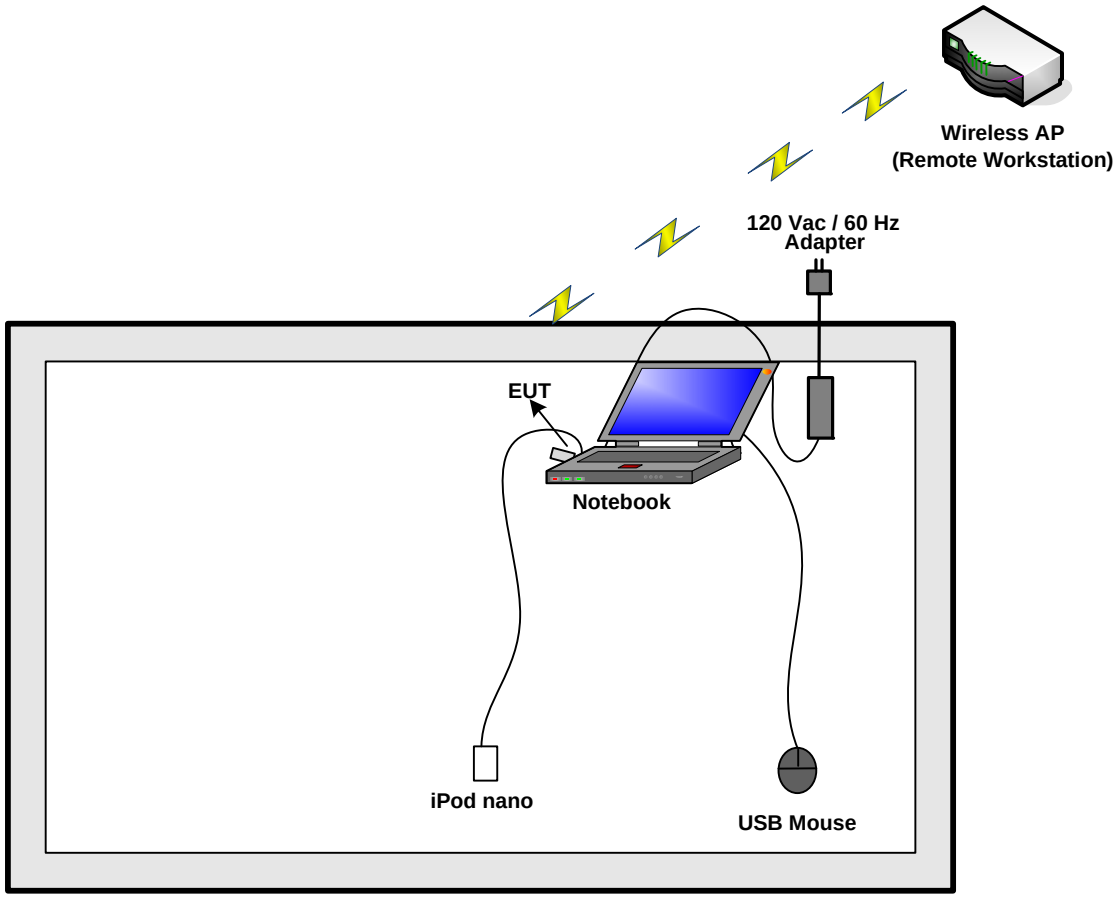
d. The EUT connect to remote workstation (Wireless AP) via WiFi.

Radiated emissions above 1GHz

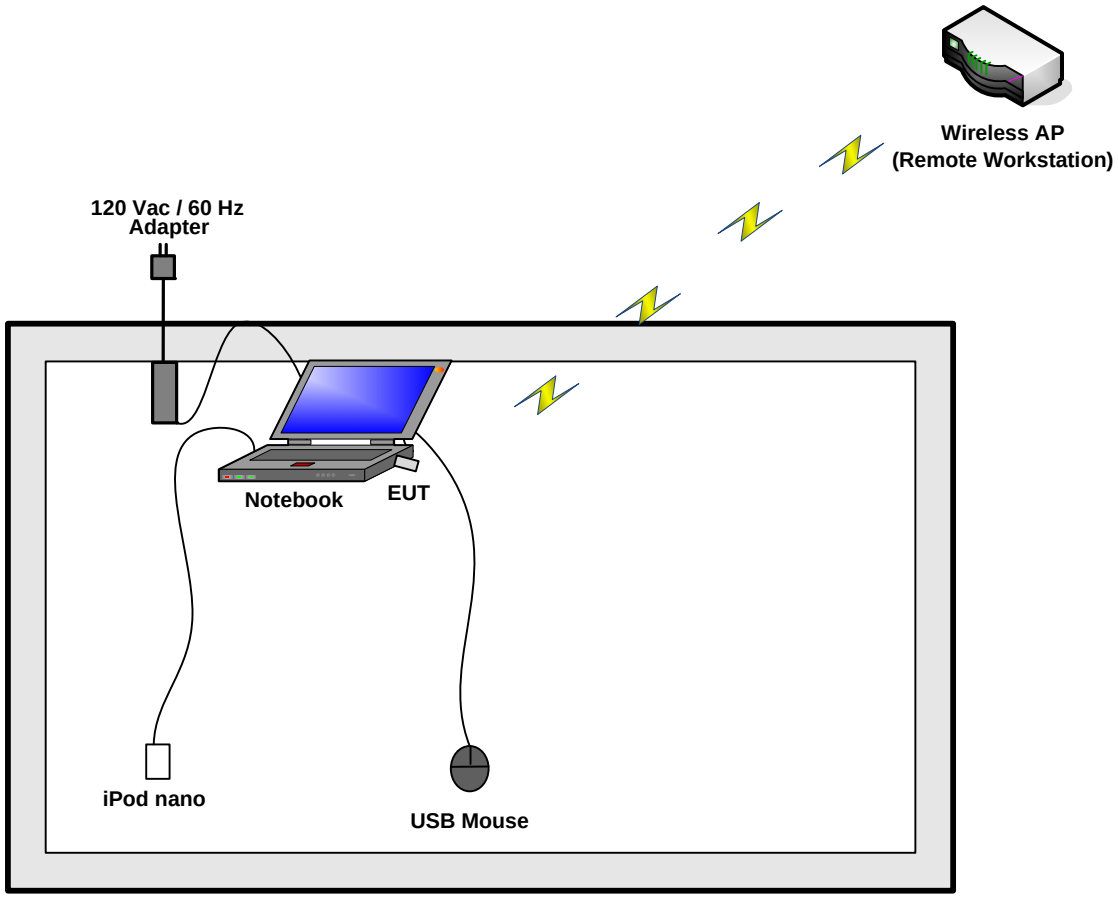
The Notebook executed “RT 5x7x QA” to EUT keep transmitting signals at fixed frequency via wireless.

2.9 Test Configuration

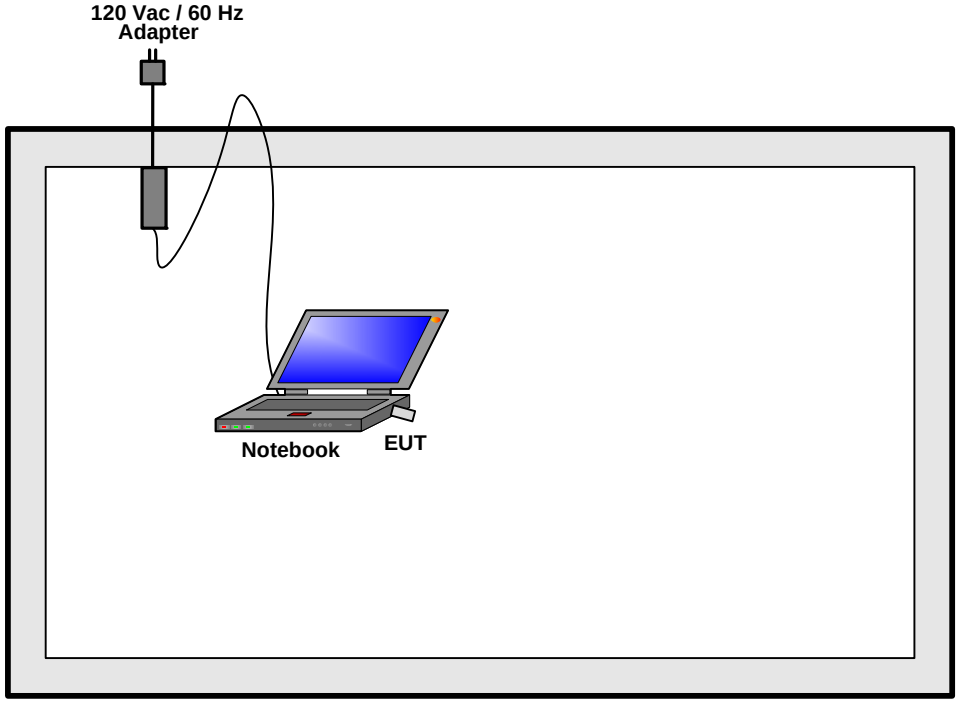
Conducted emissions



Radiated emissions 9kHz~1GHz



Radiated emissions above 1GHz



3 TEST RESULT

3.1 AC Power Line Conducted Emissions Measurement

3.1.1 Limit

For this product which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Class B

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

3.1.2 Measuring Instruments and Setting

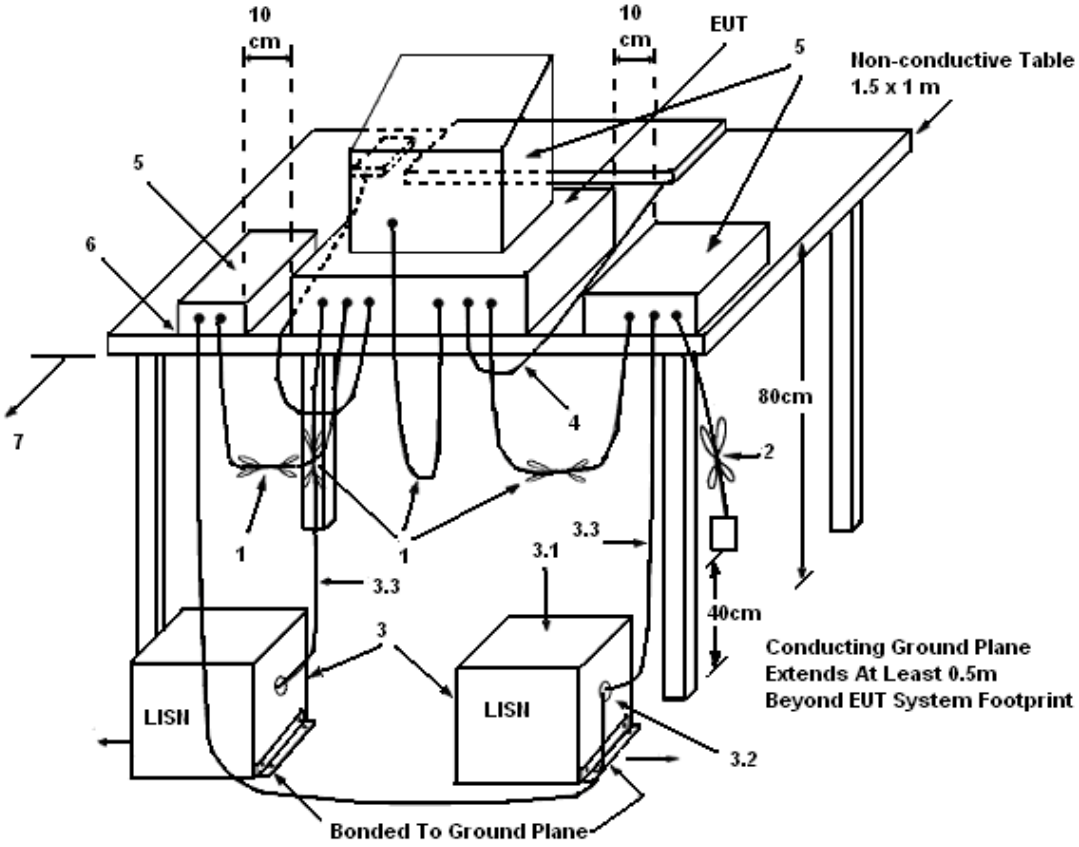
Please refer to section 4 of equipments list in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

3.1.3 Test Procedures

1. The EUT was warmed up for 15 minutes before testing started.
2. The EUT was placed on a desk 0.8 meters height from the metal ground plane and 0.4 meter from the conducting wall of the shielding room and it was kept at least 0.8 meters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connect to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The CISPR states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 kHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

3.1.4 Test Setup Layout



LEGEND:
(1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
(2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
(3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, reference ground plane.
(3.1) All other equipment powered from additional LISN(s).
(3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
(3.3) LISN at least 80 cm from nearest part of EUT chassis.
(4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
(5) Non-EUT components of EUT system being tested.
(6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
(7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

3.1.5 Test Deviation

There is no deviation with the original standard.

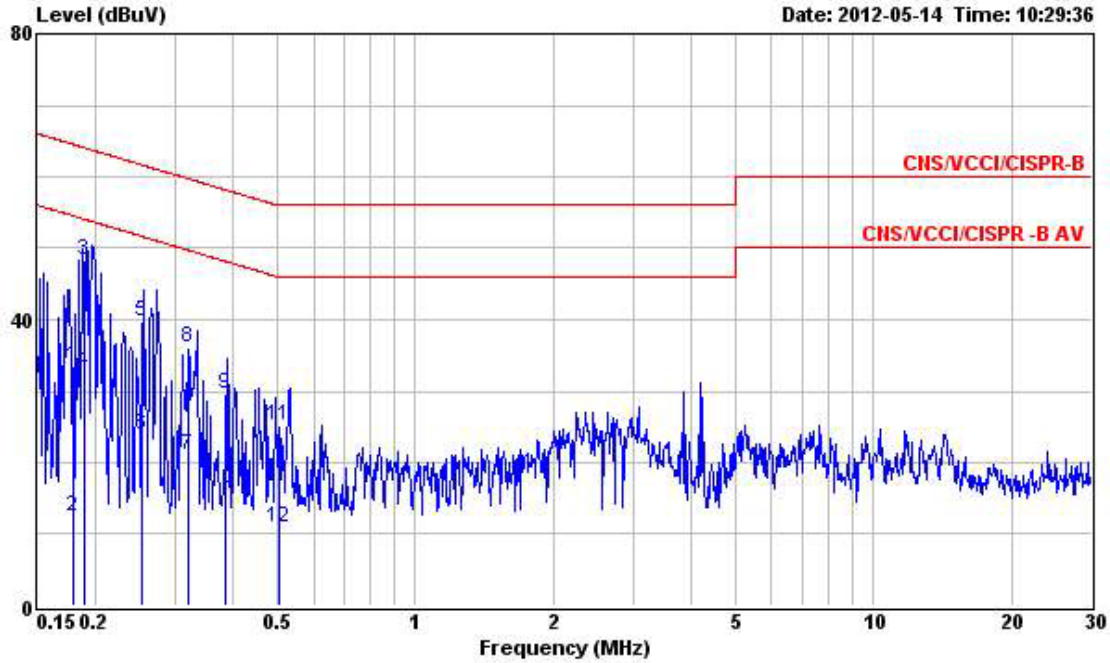
3.1.6 EUT Operation during Test

The EUT was placed on the test table and programmed in transmitting function.

3.1.7 Results of AC Power Line Conducted Emissions Measurement

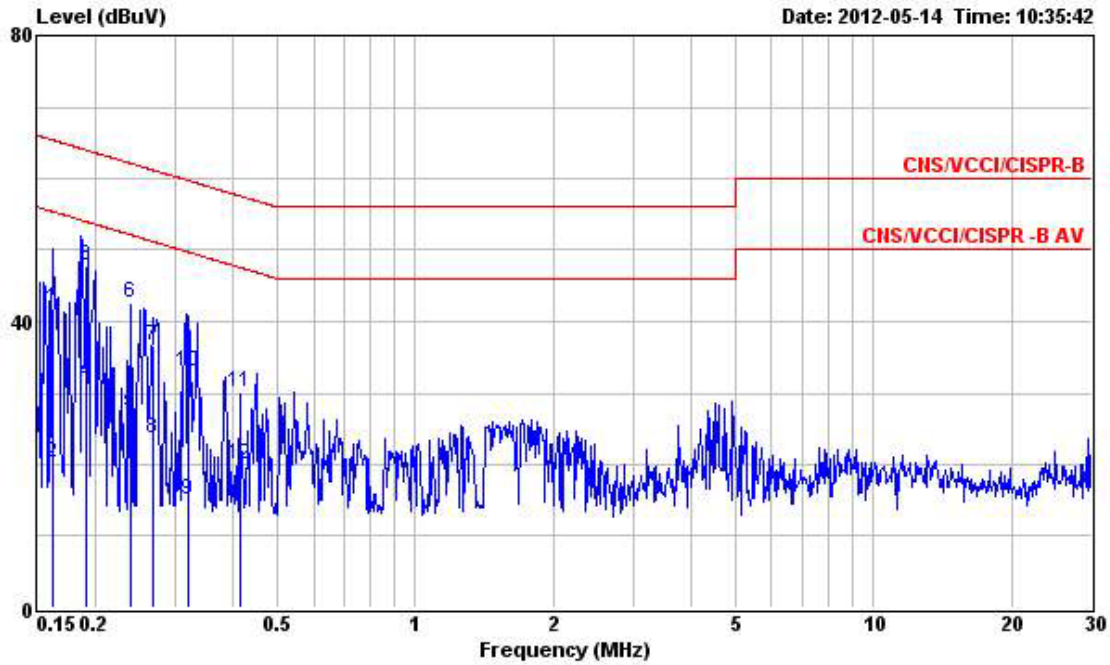
Final Test Date	May 14, 2012	**Test Site No.**	CO01-HY
Temperature	23.6℃	**Humidity**	49%
Test Engineer	David	**Configuration**	System Mode

Line



	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.179	33.55	-30.97	64.52	33.37	0.08	0.10	QP
2	0.179	12.50	-42.02	54.52	12.32	0.08	0.10	Average
3	0.190	48.41	-15.62	64.03	48.23	0.08	0.10	QP
4	0.190	32.72	-21.31	54.03	32.54	0.08	0.10	Average
5	0.252	39.65	-22.05	61.70	39.47	0.08	0.10	QP
6	0.252	23.96	-27.74	51.70	23.78	0.08	0.10	Average
7	0.320	21.12	-28.59	49.71	20.93	0.09	0.10	Average
8	0.320	36.04	-23.67	59.71	35.85	0.09	0.10	QP
9	0.386	29.65	-28.49	58.14	29.46	0.09	0.10	QP
10	0.386	16.35	-31.79	48.14	16.16	0.09	0.10	Average
11	0.503	25.13	-30.87	56.00	24.93	0.10	0.10	QP
12	0.503	11.02	-34.98	46.00	10.82	0.10	0.10	Average

Neutral



	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.162	41.94	-23.42	65.36	41.77	0.07	0.10	QP
2	0.162	20.37	-34.99	55.36	20.20	0.07	0.10	Average
3	0.191	47.88	-16.10	63.98	47.72	0.06	0.10	QP
4	0.191	31.51	-22.47	53.98	31.35	0.06	0.10	Average
5	0.238	27.19	-24.97	52.16	27.03	0.06	0.10	Average
6	0.238	42.57	-19.59	62.16	42.41	0.06	0.10	QP
7	0.267	36.55	-24.66	61.21	36.39	0.06	0.10	QP
8	0.267	23.71	-27.50	51.21	23.55	0.06	0.10	Average
9	0.321	15.09	-34.60	49.69	14.92	0.07	0.10	Average
10	0.321	32.95	-26.74	59.69	32.78	0.07	0.10	QP
11	0.413	30.14	-27.45	57.59	29.97	0.07	0.10	QP
12	0.413	20.06	-27.53	47.59	19.89	0.07	0.10	Average

Note:
Level = Read Level + Probe Factor + Cable Loss.

3.2 Maximum Peak Output Power Measurement

3.2.1 Limit

For systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

3.2.2 Measuring Instruments and Setting

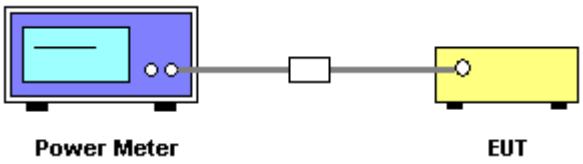
Please refer to section 4 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Filter No.	Auto
Measurement time	0.135 s ~ 26 s
Used Peak Sensor	MA2411B

3.2.3 Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Turn on the EUT and power meter and then record the peak power value.
3. Repeat above procedures on all channels needed to be tested.
4. When measuring maximum conducted output power within multiple antenna systems, add every result of the values by mathematic formula. (Only for IEEE 802.11n test)

3.2.4 Test Setup Layout



3.2.5 Test Deviation

There is no deviation with the original standard.

3.2.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.2.7 Test Result of Maximum Peak Output Power

Final Test Date	Apr. 25, 2012	**Test Site No.**	TH01-HY
Temperature	25.9℃	**Humidity**	30%
Test Engineer	Ian	**Configurations**	802.11a/n

For Single Chain:
Configuration of IEEE 802.11a Port 2

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	20.29	29.36	**Complies**
157	5785 MHz	20.20	29.36	**Complies**
165	5825 MHz	18.66	29.36	**Complies**

For Two Chains:

Configuration IEEE 802.11n (20MHz) Port 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	21.14	29.36	**Complies**
157	5785 MHz	19.97	29.36	**Complies**
165	5825 MHz	18.85	29.36	**Complies**

Configuration IEEE 802.11n (20MHz) Port 2

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	21.47	29.36	**Complies**
157	5785 MHz	18.27	29.36	**Complies**
165	5825 MHz	18.21	29.36	**Complies**

Configuration IEEE 802.11n (20MHz) Port 1+ Port 2

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	24.32	29.36	**Complies**
157	5785 MHz	22.21	29.36	**Complies**
165	5825 MHz	21.55	29.36	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 1

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	19.67	29.36	**Complies**
159	5795 MHz	19.47	29.36	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 2

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	18.89	29.36	**Complies**
159	5795 MHz	19.19	29.36	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 1+ Port 2

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	22.31	29.36	**Complies**
159	5795 MHz	22.34	29.36	**Complies**

3.3 Power Spectral Density Measurement

3.3.1 Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

3.3.2 Measuring Instruments and Setting

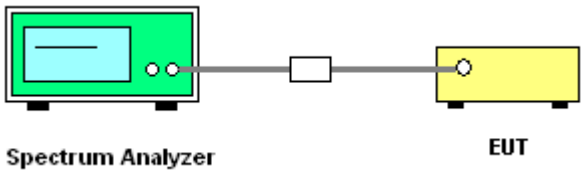
Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	1.5MHz
RB	3 kHz
VB	30 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	500s

3.3.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set RBW of spectrum analyzer to 3kHz and VBW to 30kHz. Set Detector to Peak, Trace to Max Hold.
3. Mark the frequency with maximum peak power as the center of the display of the spectrum.
4. Set the span to 1.5MHz and the sweep time to 500s and record the maximum peak value.
5. When measuring maximum conducted output power within multiple antenna systems, add every result of the values by mathematic formula. (Only for IEEE 802.11n test)

3.3.4 Test Setup Layout



3.3.5 Test Deviation

There is no deviation with the original standard.

3.3.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.3.7 Test Result of Power Spectral Density

Final Test Date	Apr. 25, 2012	**Test Site No.**	TH01-HY
Temperature	25.9℃	**Humidity**	30%
Test Engineer	Ian	**Configurations**	802.11a/n

For Single Chain:
Configuration of IEEE 802.11a Port 2

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	-12.73	7.36	**Complies**
157	5785 MHz	-13.95	7.36	**Complies**
165	5825 MHz	-12.21	7.36	**Complies**

For Two Chains:

Configuration of IEEE 802.11n (20MHz) Port 1

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	-14.80	7.36	**Complies**
157	5785 MHz	-15.77	7.36	**Complies**
165	5825 MHz	-17.10	7.36	**Complies**

Configuration of IEEE 802.11n (20MHz) Port 2

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	-13.32	7.36	**Complies**
157	5785 MHz	-13.74	7.36	**Complies**
165	5825 MHz	-14.08	7.36	**Complies**

Configuration of IEEE 802.11n (20MHz) Port 1+ Port 2

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	-10.99	7.36	**Complies**
157	5785 MHz	-11.63	7.36	**Complies**
165	5825 MHz	-12.32	7.36	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 1

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	-14.46	7.36	**Complies**
159	5795 MHz	-15.07	7.36	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 2

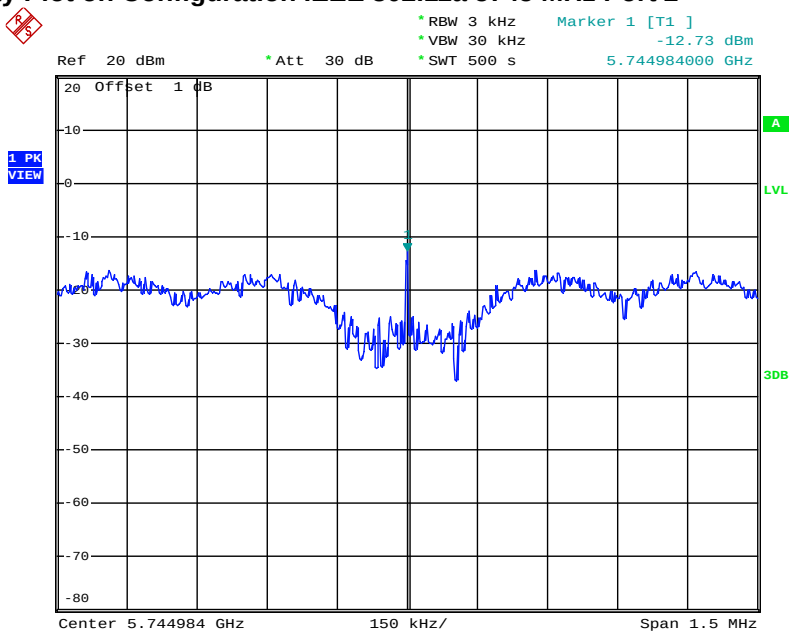
Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	-16.05	7.36	**Complies**
159	5795 MHz	-16.25	7.36	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 1+ Port 2

Channel	Frequency	Power Density (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	-12.17	7.36	**Complies**
159	5795 MHz	-12.61	7.36	**Complies**

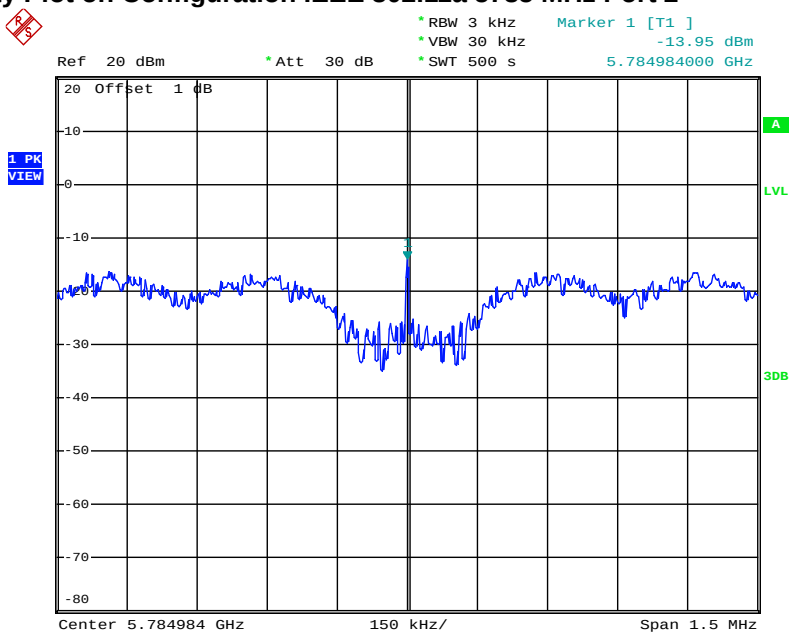
For Single Chain:

Power Density Plot on Configuration IEEE 802.11a 5745 MHz Port 2



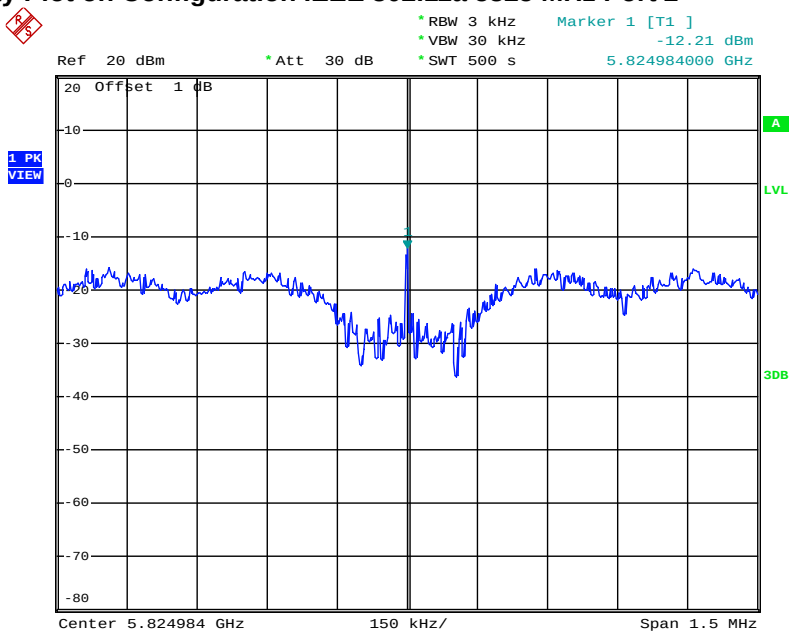
Date: 24.APR.2012 22:10:03

Power Density Plot on Configuration IEEE 802.11a 5785 MHz Port 2



Date: 24.APR.2012 22:12:18

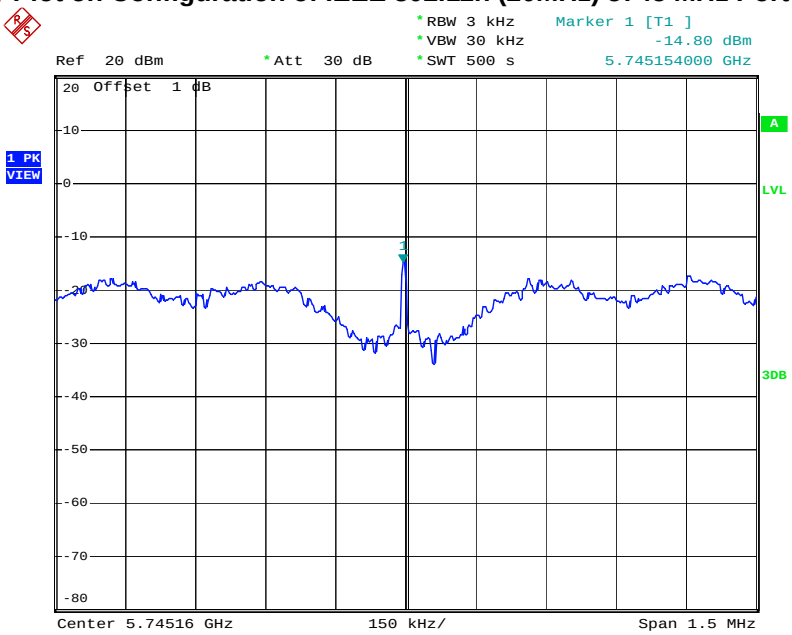
Power Density Plot on Configuration IEEE 802.11a 5825 MHz Port 2



Date: 24.APR.2012 22:15:17

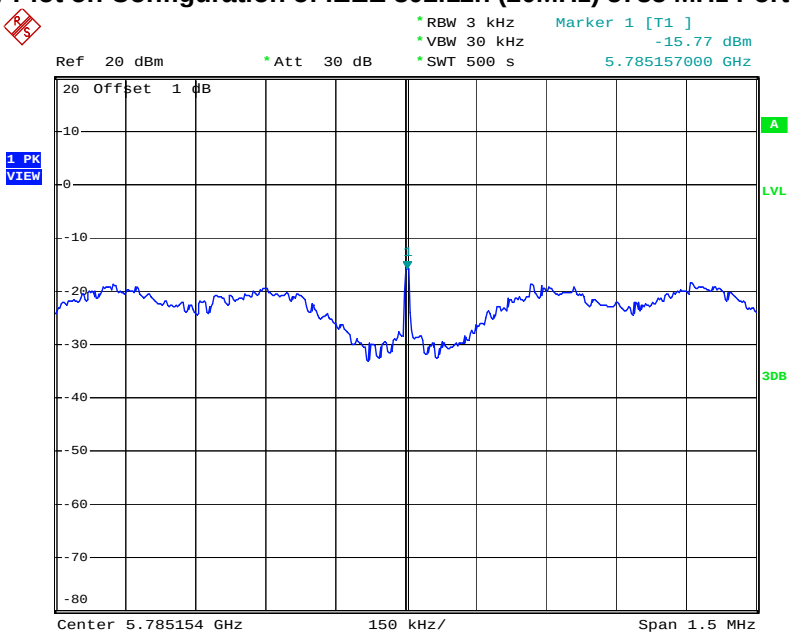
For Two Chains:

Power Density Plot on Configuration of IEEE 802.11n (20MHz) 5745 MHz Port 1



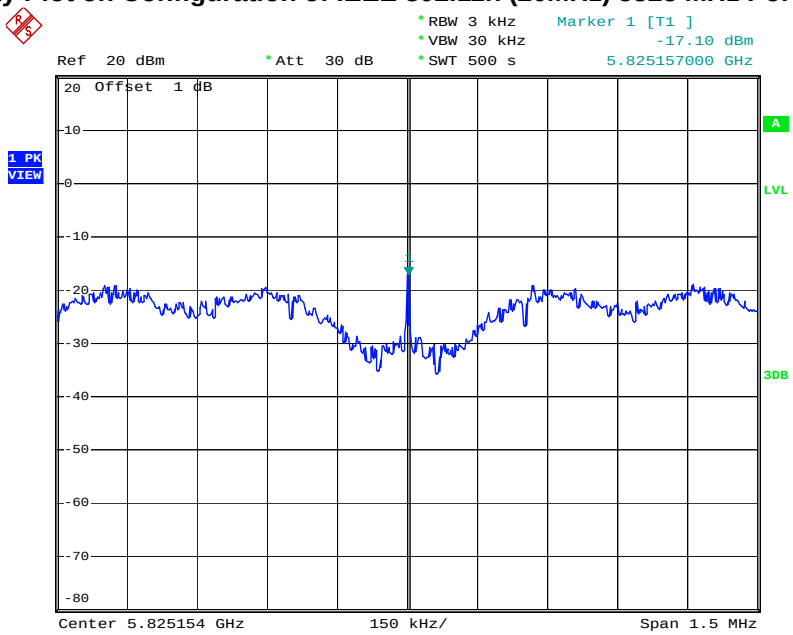
Date: 25.APR.2012 16:40:24

Power Density Plot on Configuration of IEEE 802.11n (20MHz) 5785 MHz Port 1



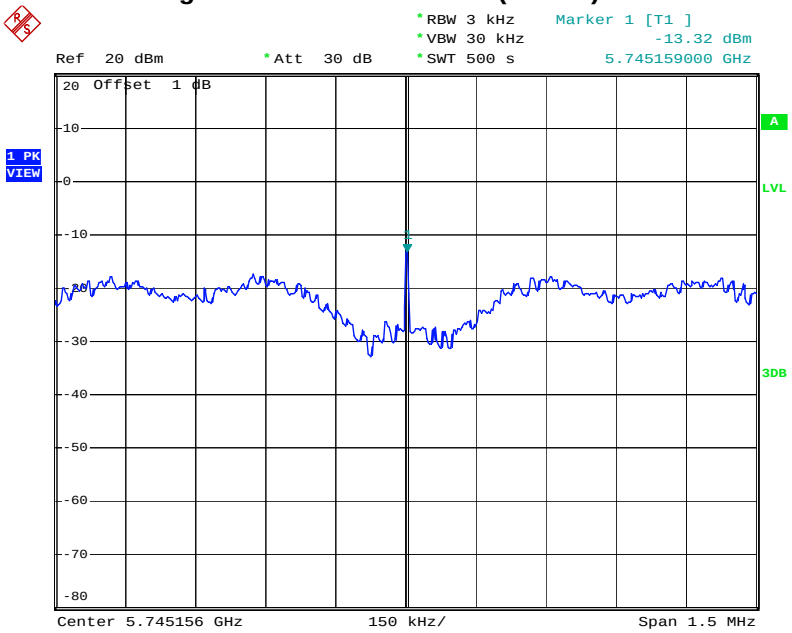
Date: 25.APR.2012 16:42:48

Power Density Plot on Configuration of IEEE 802.11n (20MHz) 5825 MHz Port 1



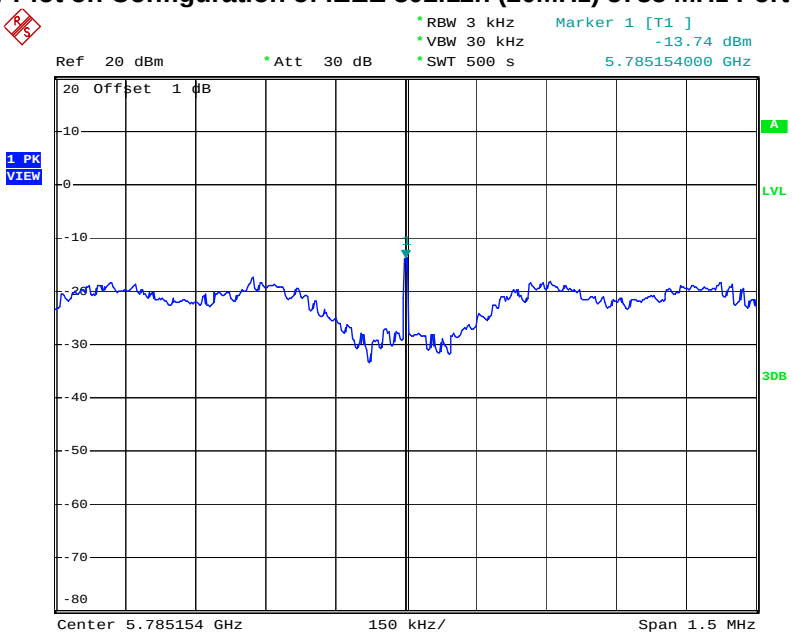
Date: 25.APR.2012 16:46:05

Power Density Plot on Configuration of IEEE 802.11n (20MHz) 5745 MHz Port 2



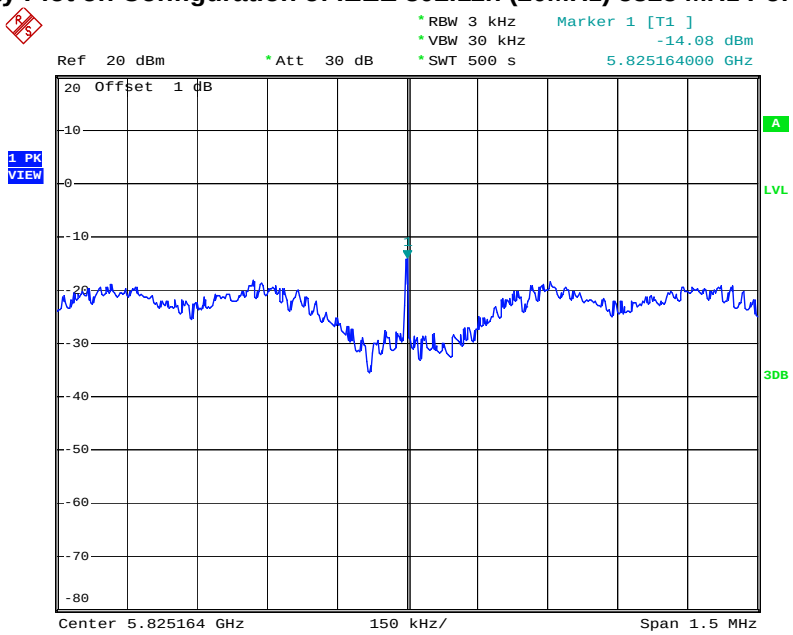
Date: 25.APR.2012 16:52:29

Power Density Plot on Configuration of IEEE 802.11n (20MHz) 5785 MHz Port 2



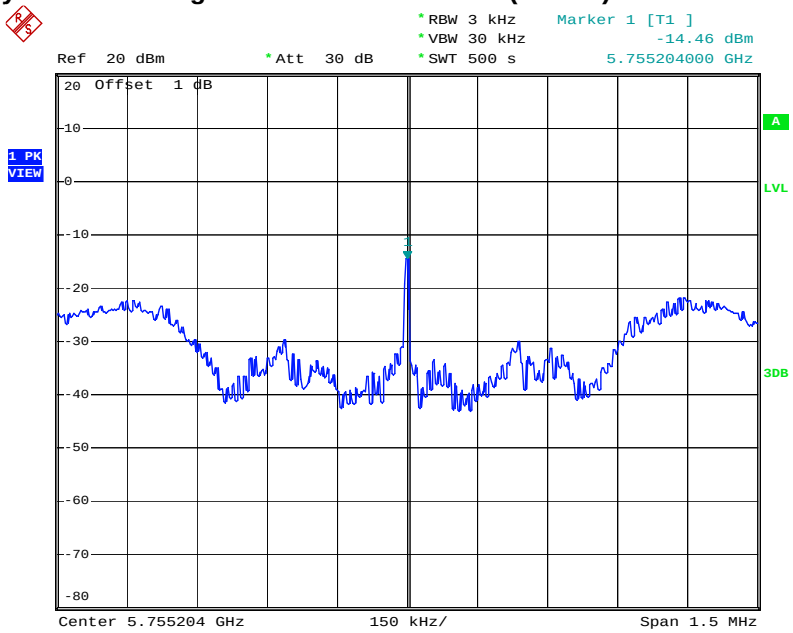
Date: 25.APR.2012 16:54:51

Power Density Plot on Configuration of IEEE 802.11n (20MHz) 5825 MHz Port 2



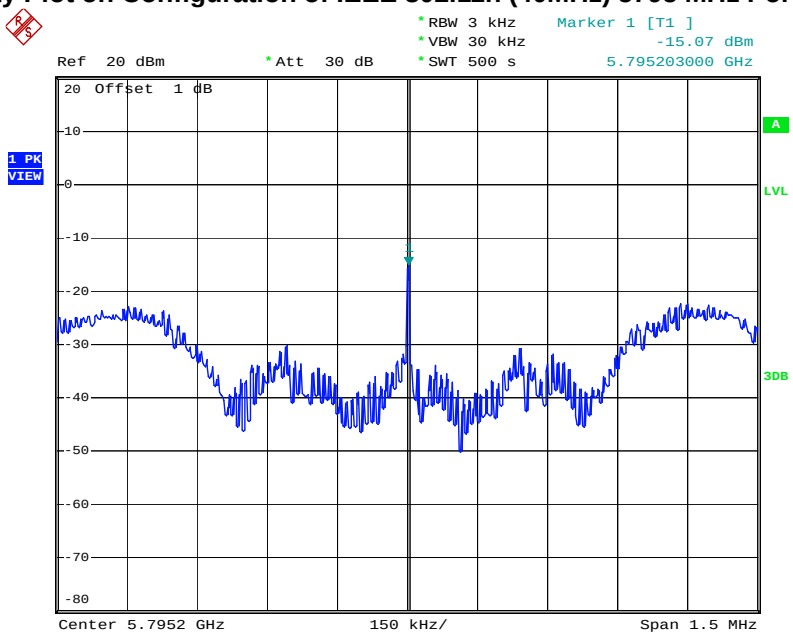
Date: 25.APR.2012 16:58:15

Power Density Plot on Configuration of IEEE 802.11n (40MHz) 5755 MHz Port 1



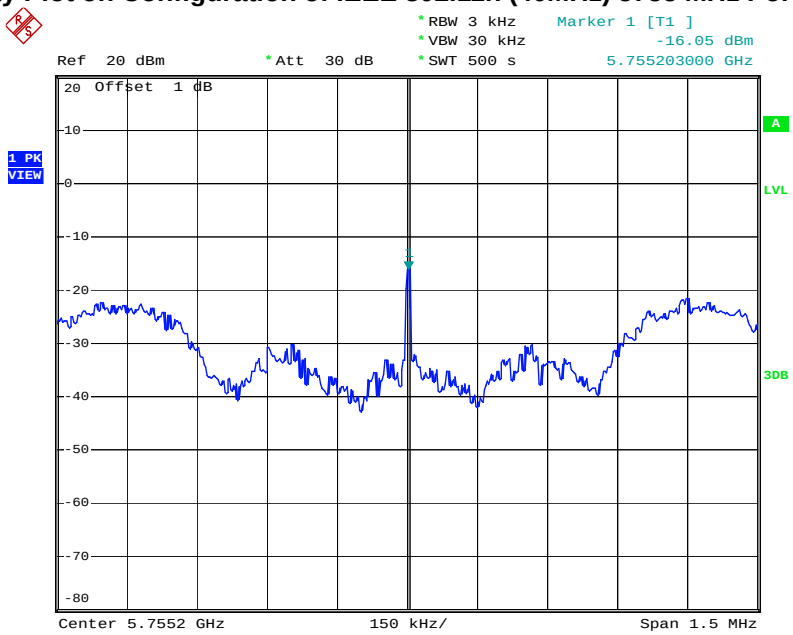
Date: 25.APR.2012 17:08:15

Power Density Plot on Configuration of IEEE 802.11n (40MHz) 5795 MHz Port 1



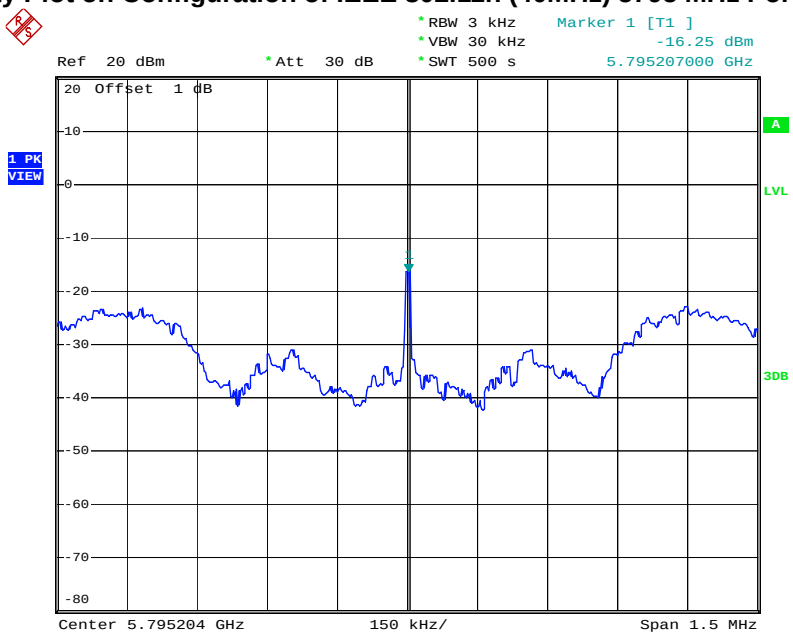
Date: 25.APR.2012 17:11:48

Power Density Plot on Configuration of IEEE 802.11n (40MHz) 5755 MHz Port 2



Date: 25.APR.2012 17:17:12

Power Density Plot on Configuration of IEEE 802.11n (40MHz) 5795 MHz Port 2



Date: 25.APR.2012 17:20:51

3.4 6dB Spectrum Bandwidth Measurement

3.4.1 Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.

3.4.2 Measuring Instruments and Setting

Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RB	100 kHz
VB	300 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

3.4.3 Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. For 6dB Bandwidth the resolution bandwidth of 100 kHz and the video bandwidth of 300 kHz were used.
3. Measured the spectrum width with power higher than 6dB below carrier.
4. For 99% Occupied Bandwidth the resolution Bandwidth of 100 kHz and the video bandwidth of 300 kHz were used.

3.4.4 Test Setup Layout

3.4.5 Test Deviation

There is no deviation with the original standard.

3.4.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.4.7 Test Result of 6dB Spectrum Bandwidth

Final Test Date	Apr. 25, 2012	**Test Site No.**	TH01-HY
Temperature	25.9℃	**Humidity**	30%
Test Engineer	Ian	**Configurations**	802.11a/n

For Single Chain:
Configuration of IEEE 802.11a Port 2

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	16.52	16.40	500	Complies
157	5785 MHz	16.52	16.40	500	Complies
165	5825 MHz	16.44	16.36	500	Complies

For Two Chains:

Configuration IEEE 802.11n (20MHz) Port 1

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	17.56	17.52	500	Complies
157	5785 MHz	17.52	17.48	500	Complies
165	5825 MHz	17.52	17.48	500	Complies

Configuration of IEEE 802.11n (20MHz) Port 2

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	17.64	17.52	500	Complies
157	5785 MHz	17.64	17.48	500	Complies
165	5825 MHz	17.60	17.52	500	Complies

Configuration of IEEE 802.11n (40MHz) Port 1

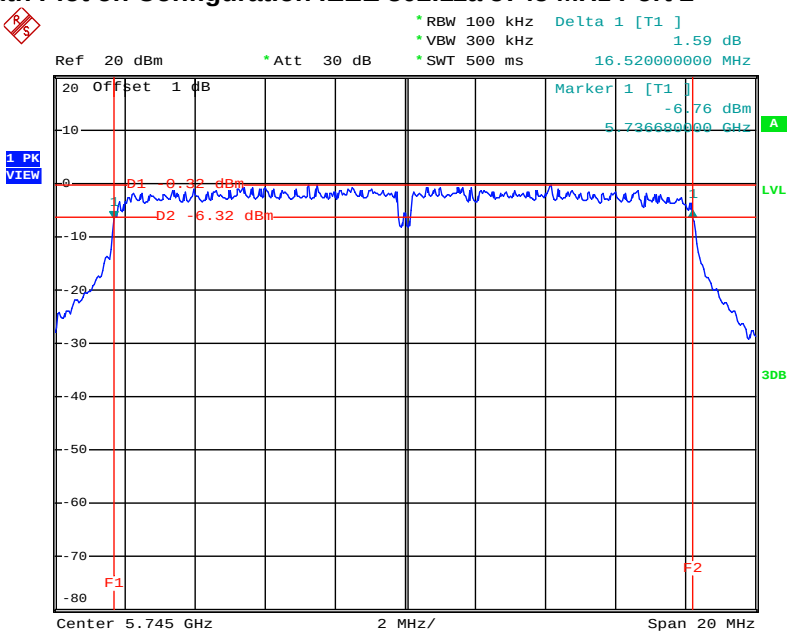
Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
151	5755 MHz	36.48	36.00	500	**Complies**
159	5795 MHz	36.48	36.00	500	**Complies**

Configuration of IEEE 802.11n (40MHz) Port 2

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
151	5755 MHz	36.40	36.08	500	**Complies**
159	5795 MHz	36.40	35.92	500	**Complies**

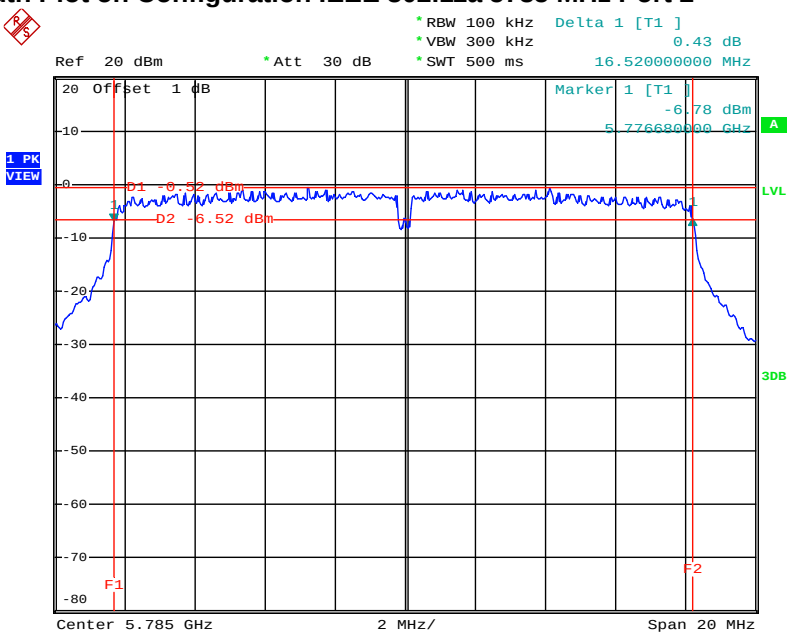
For Single Chain:

6 dB Bandwidth Plot on Configuration IEEE 802.11a 5745 MHz Port 2



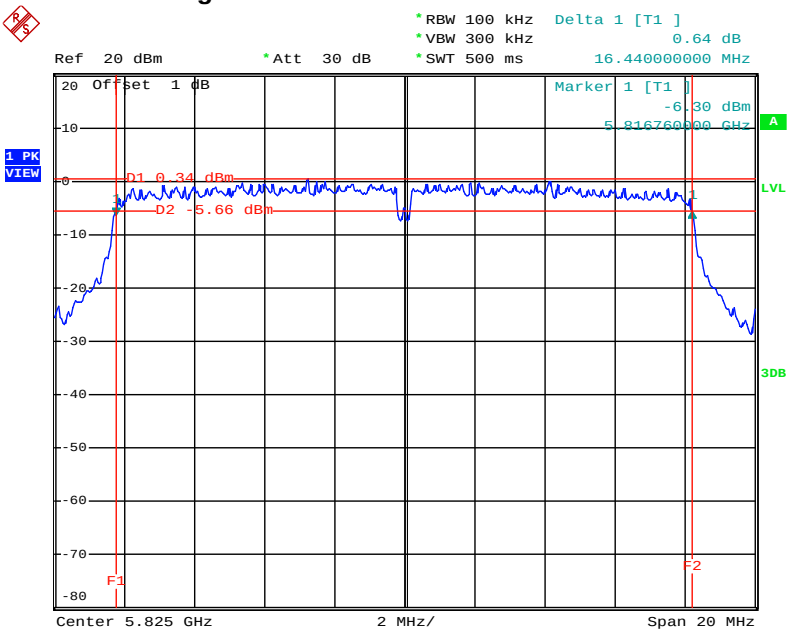
Date: 24.APR.2012 21:42:38

6 dB Bandwidth Plot on Configuration IEEE 802.11a 5785 MHz Port 2



Date: 24.APR.2012 22:11:30

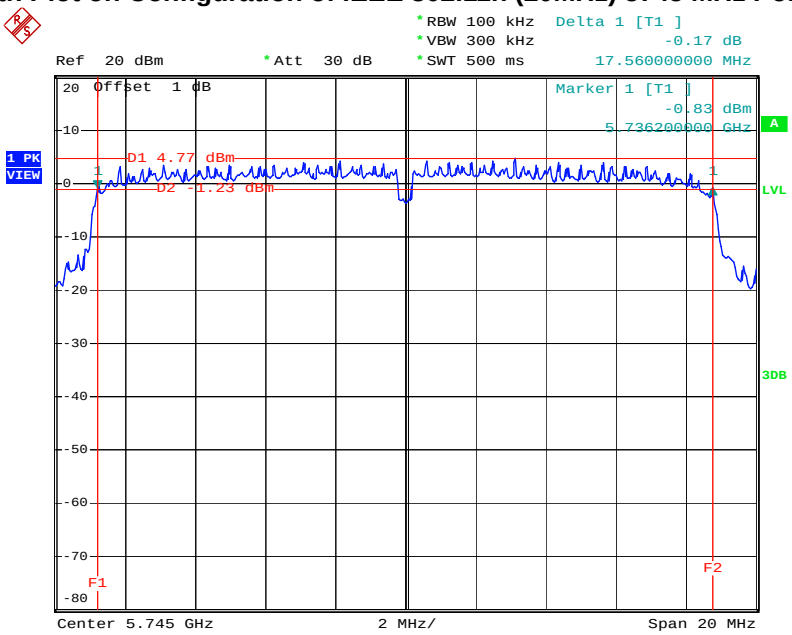
6 dB Bandwidth Plot on Configuration IEEE 802.11a 5825 MHz Port 2



Date: 24.APR.2012 22:13:46

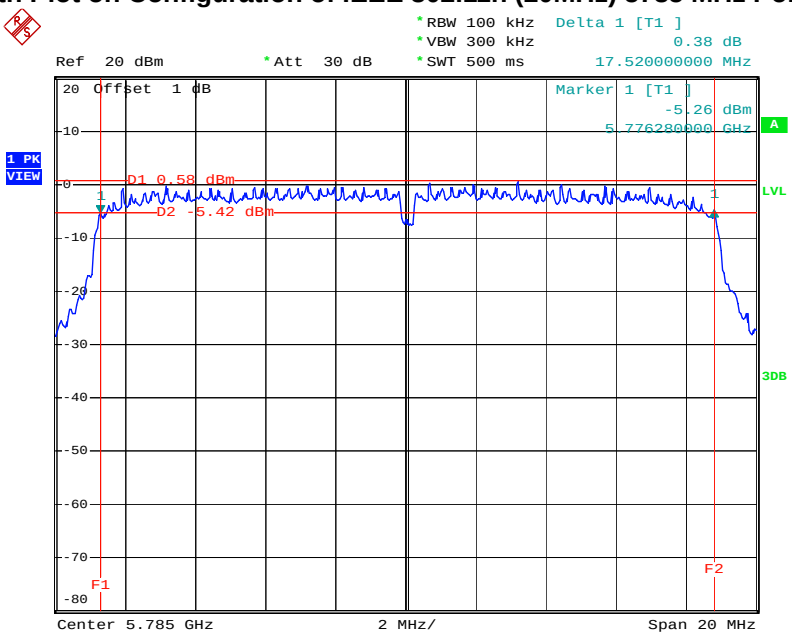
For Two Chains:

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) 5745 MHz Port 1



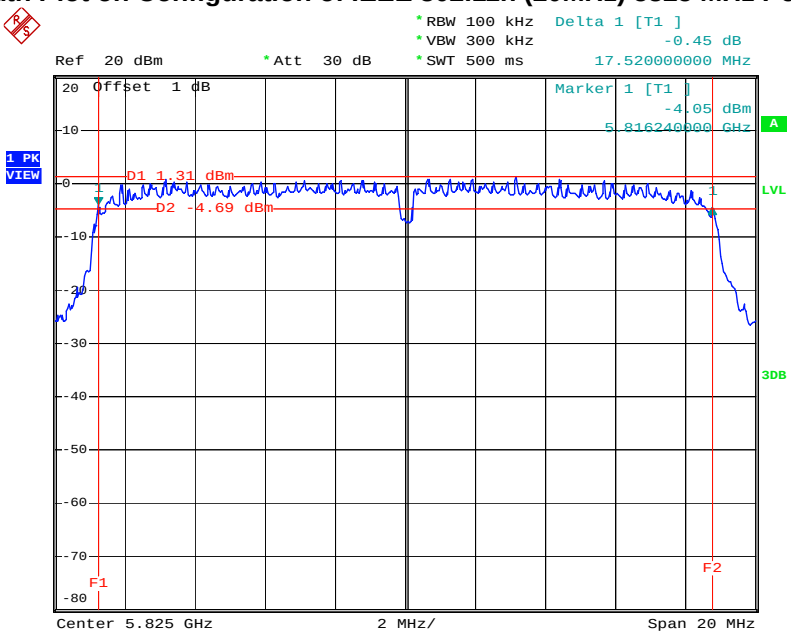
Date: 25.APR.2012 16:37:48

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) 5785 MHz Port 1



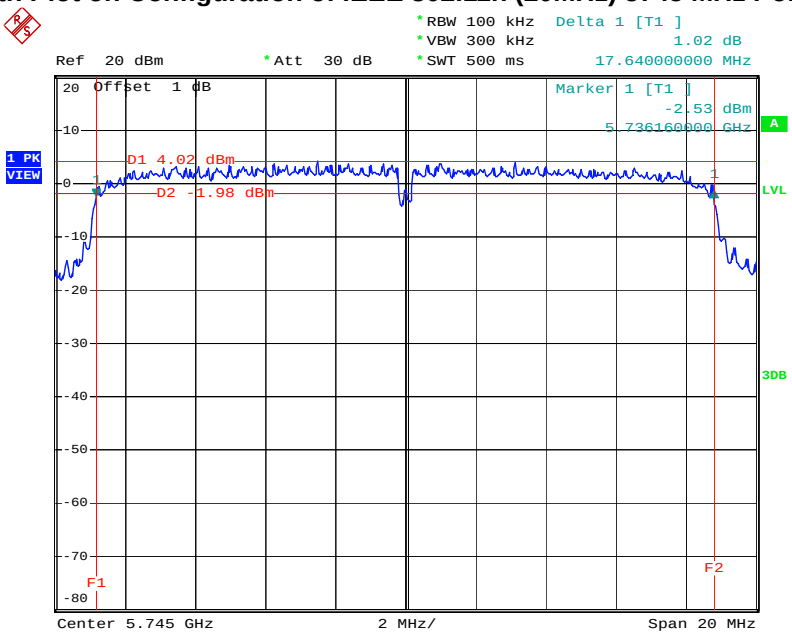
Date: 25.APR.2012 16:41:52

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) 5825 MHz Port 1



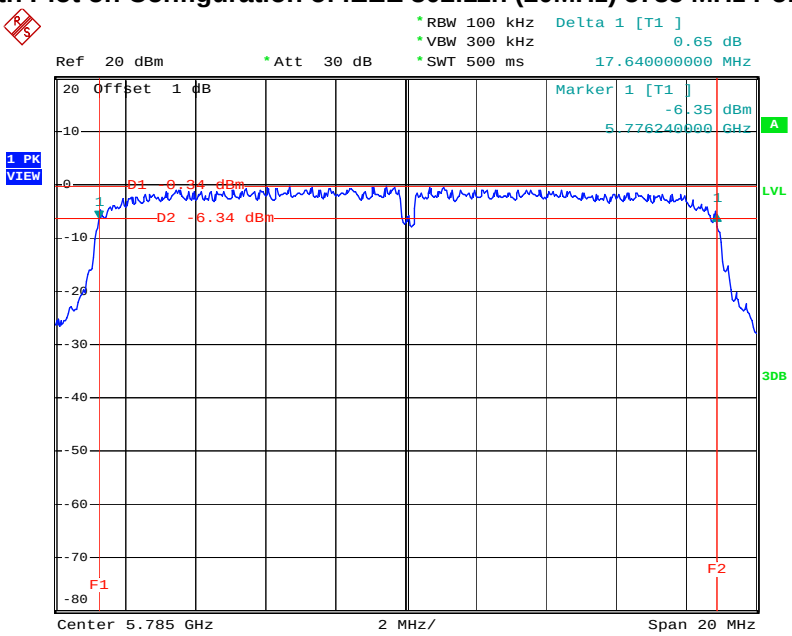
Date: 25.APR.2012 16:44:24

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) 5745 MHz Port 2



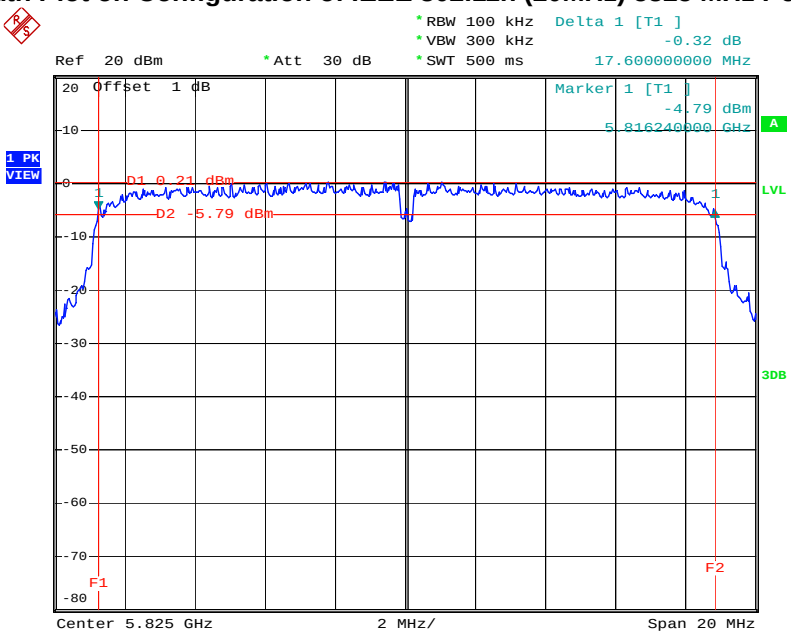
Date: 25.APR.2012 16:50:55

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) 5785 MHz Port 2



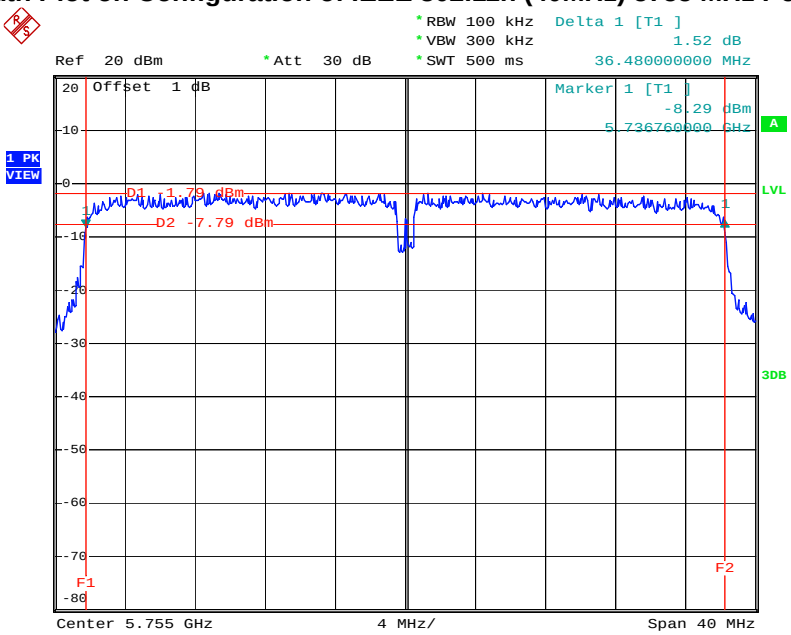
Date: 25.APR.2012 16:53:43

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) 5825 MHz Port 2



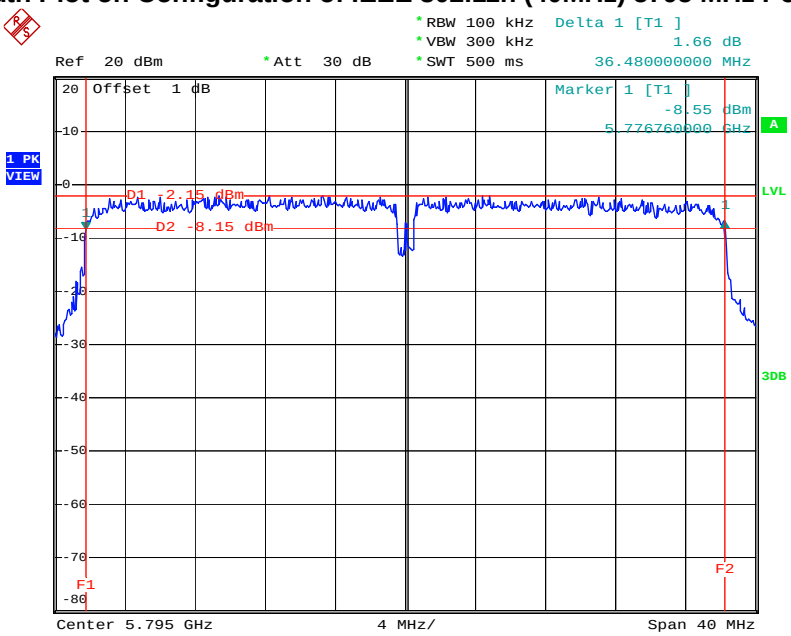
Date: 25.APR.2012 16:56:35

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (40MHz) 5755 MHz Port 1



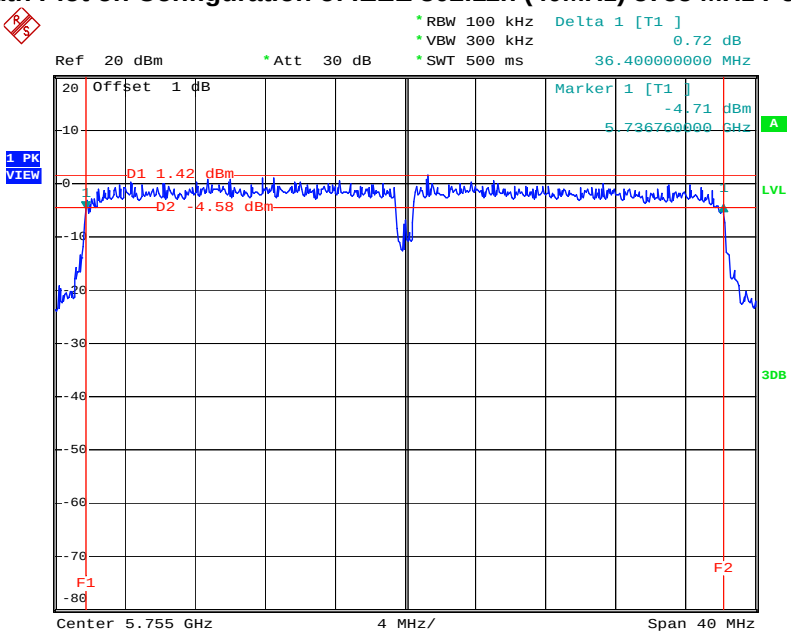
Date: 25.APR.2012 17:06:15

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (40MHz) 5795 MHz Port 1



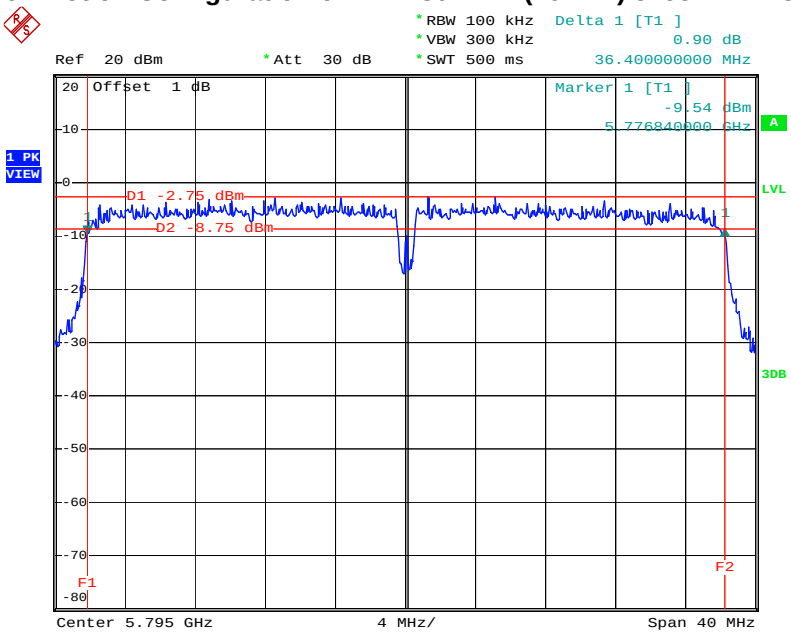
Date: 25.APR.2012 17:09:55

6 dB Bandwidth Plot on Configuration of IEEE 802.11n (40MHz) 5755 MHz Port 2



Date: 25.APR.2012 17:15:29

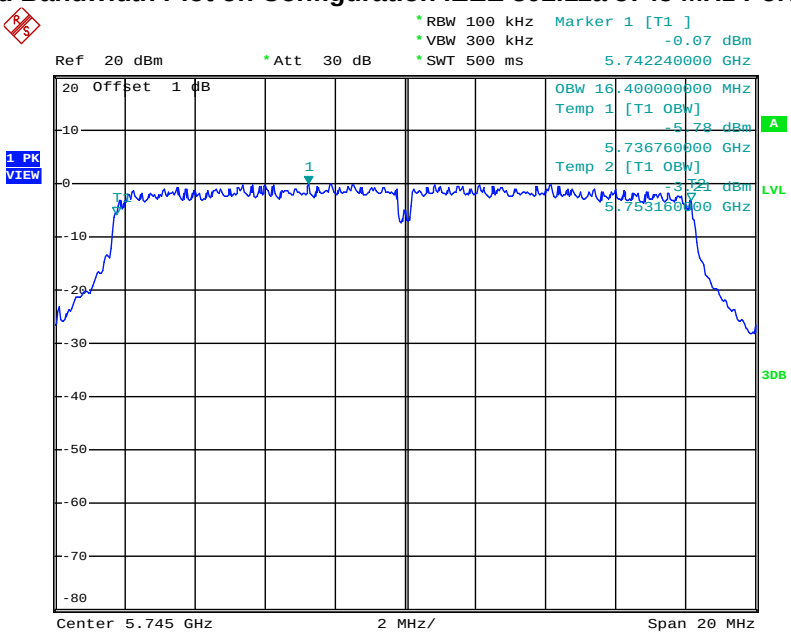
6 dB Bandwidth Plot on Configuration of IEEE 802.11n (40MHz) 5795 MHz Port 2



Date: 25.APR.2012 17:19:04

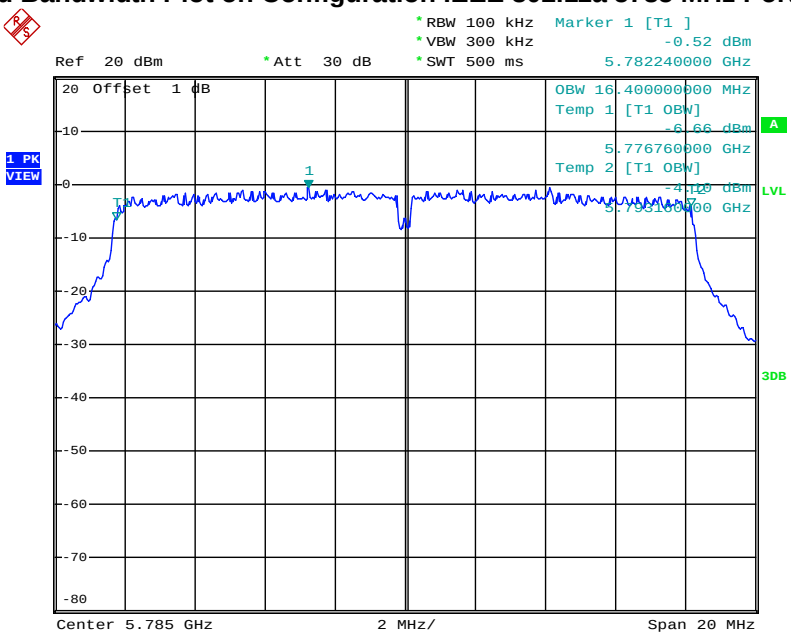
For Single Chain:

99% Occupied Bandwidth Plot on Configuration IEEE 802.11a 5745 MHz Port 2



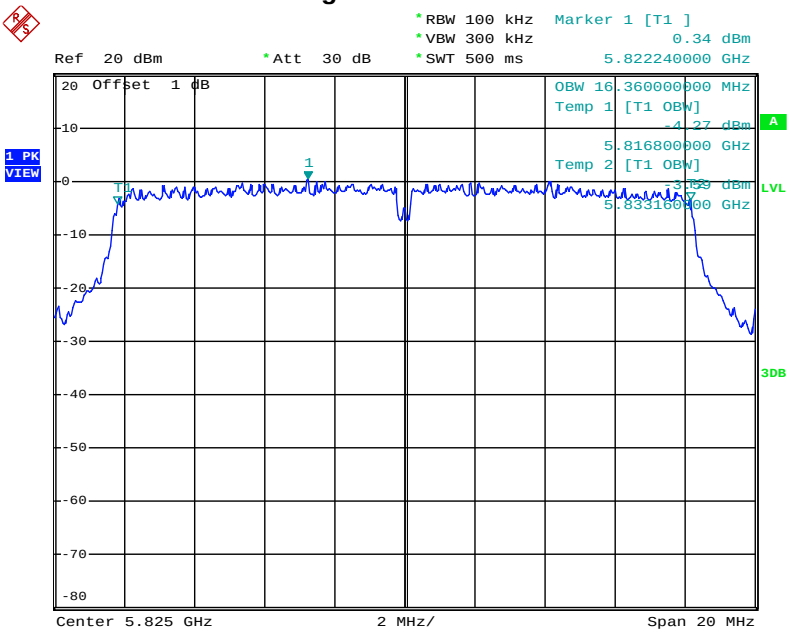
Date: 24.APR.2012 22:08:20

99% Occupied Bandwidth Plot on Configuration IEEE 802.11a 5785 MHz Port 2



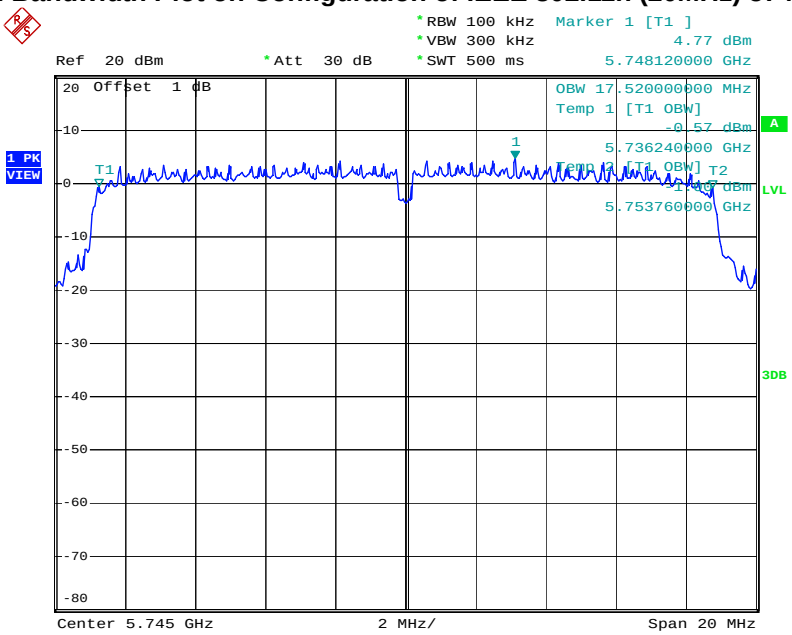
Date: 24.APR.2012 22:11:39

99% Occupied Bandwidth Plot on Configuration IEEE 802.11a 5825 MHz Port 2



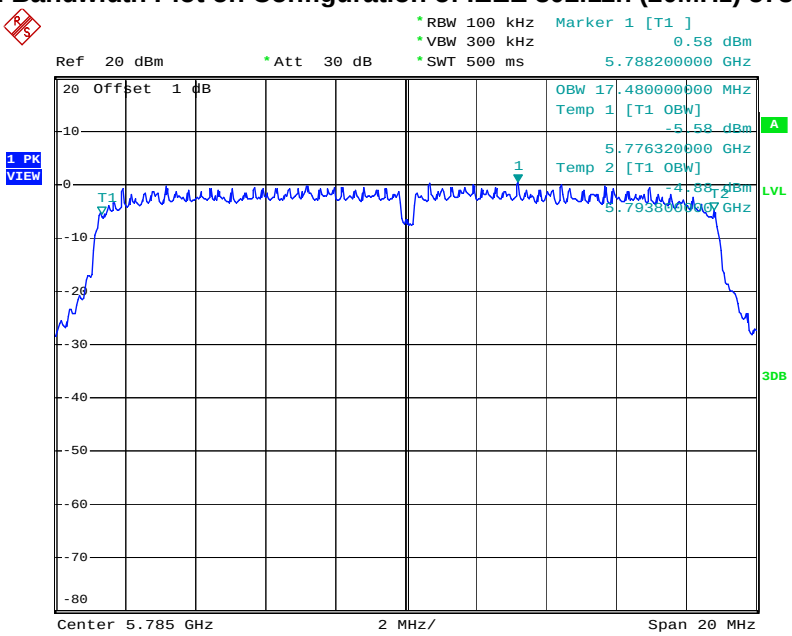
For Two Chains:

99% Occupied Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) 5745 MHz Port 1



Date: 25.APR.2012 16:38:02

99% Occupied Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) 5785 MHz Port 1



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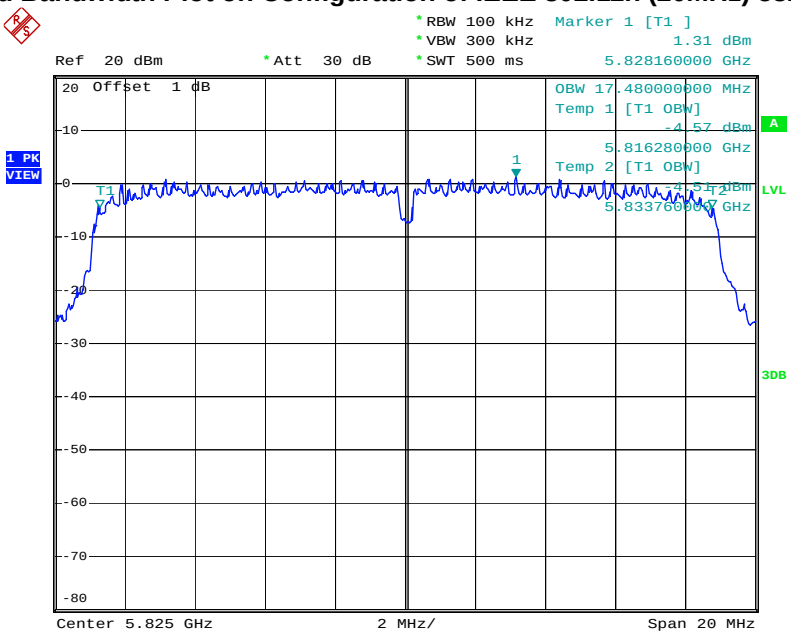
99% Occupied Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) 5825 MHz Port 1



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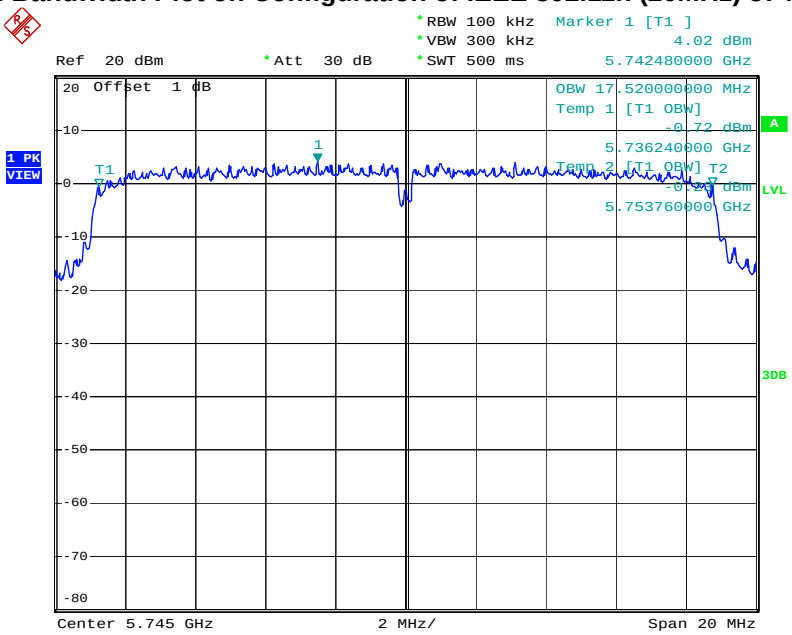
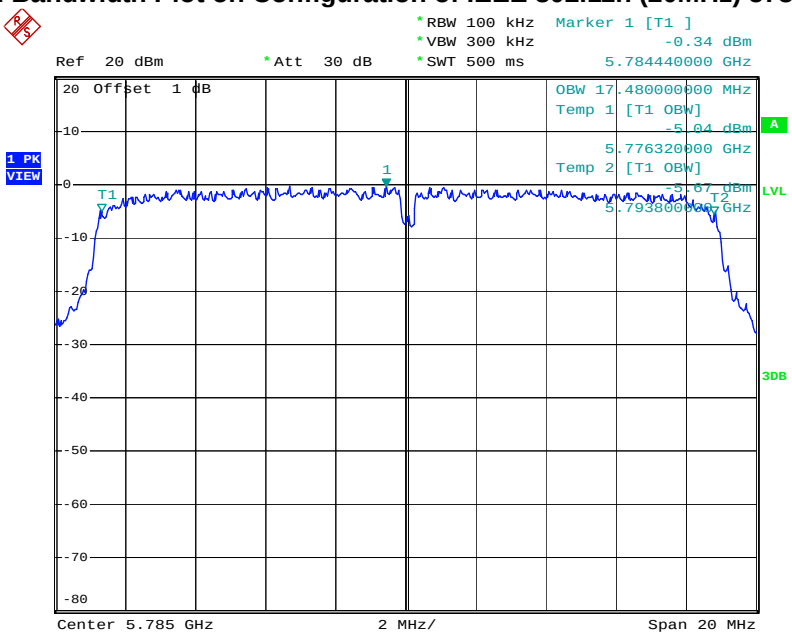
99% Occupied Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) 5745 MHz Port 2



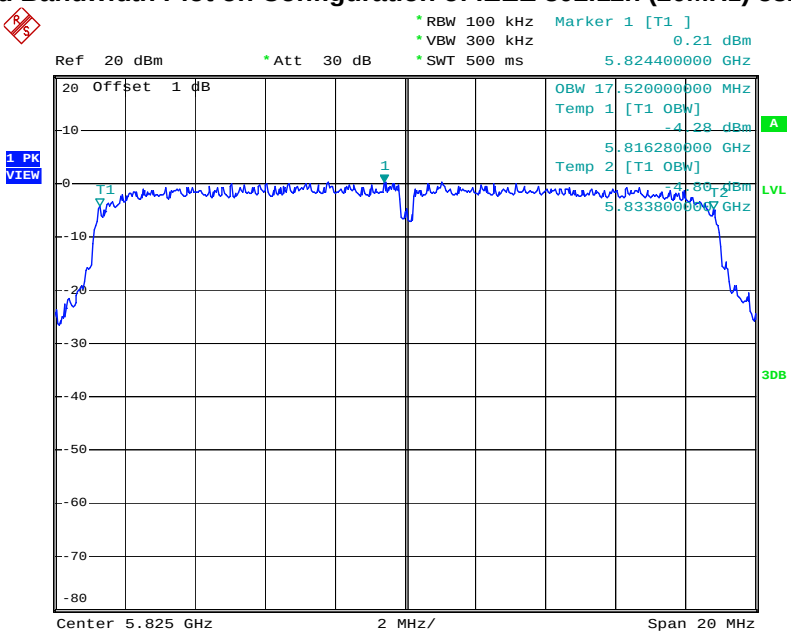
Date: 25.APR.2012 16:51:06

99% Occupied Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) 5785 MHz Port 2



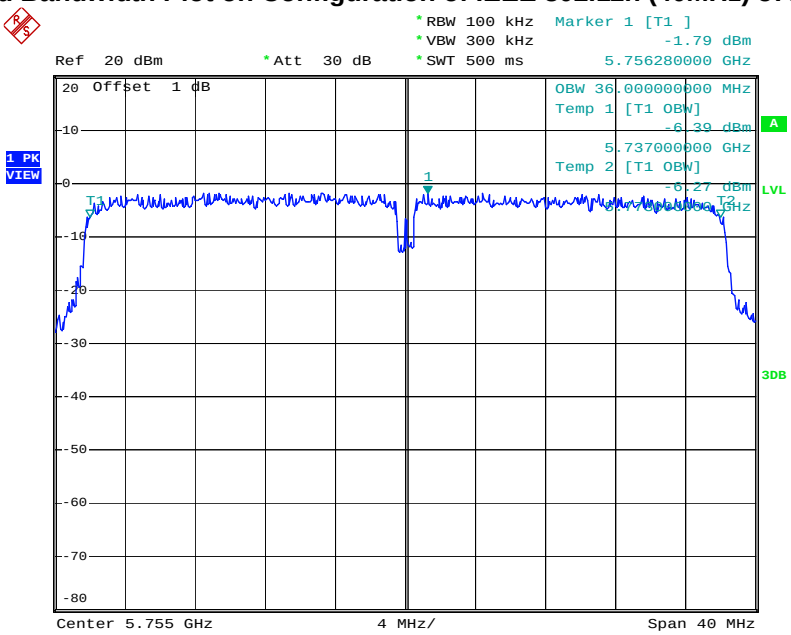
Date: 25.APR.2012 16:53:51

99% Occupied Bandwidth Plot on Configuration of IEEE 802.11n (20MHz) 5825 MHz Port 2



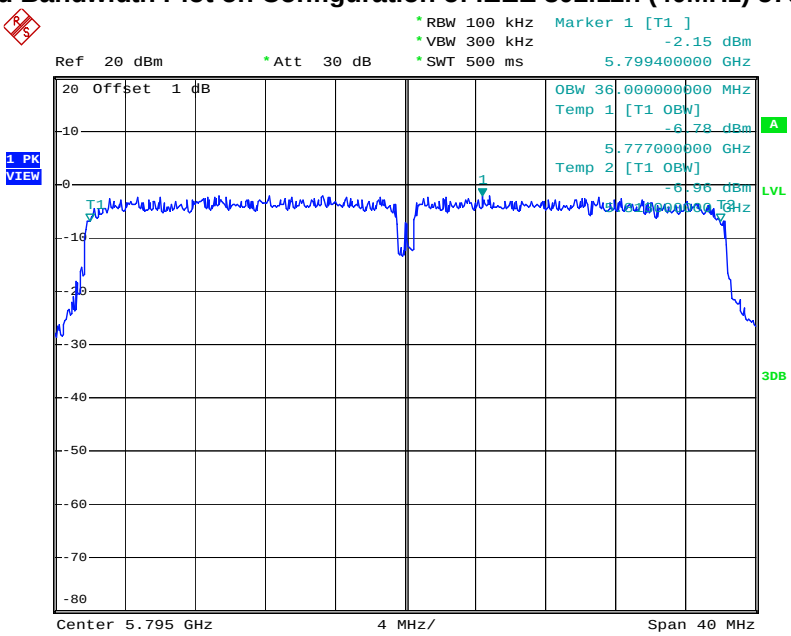
Date: 25.APR.2012 16:56:45

99% Occupied Bandwidth Plot on Configuration of IEEE 802.11n (40MHz) 5755 MHz Port 1



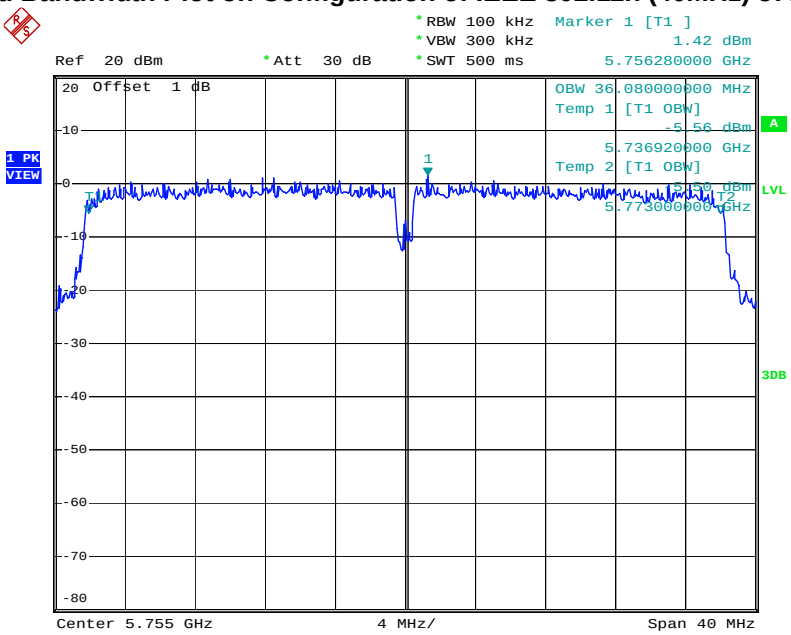
Date: 25.APR.2012 17:06:25

99% Occupied Bandwidth Plot on Configuration of IEEE 802.11n (40MHz) 5795 MHz Port 1



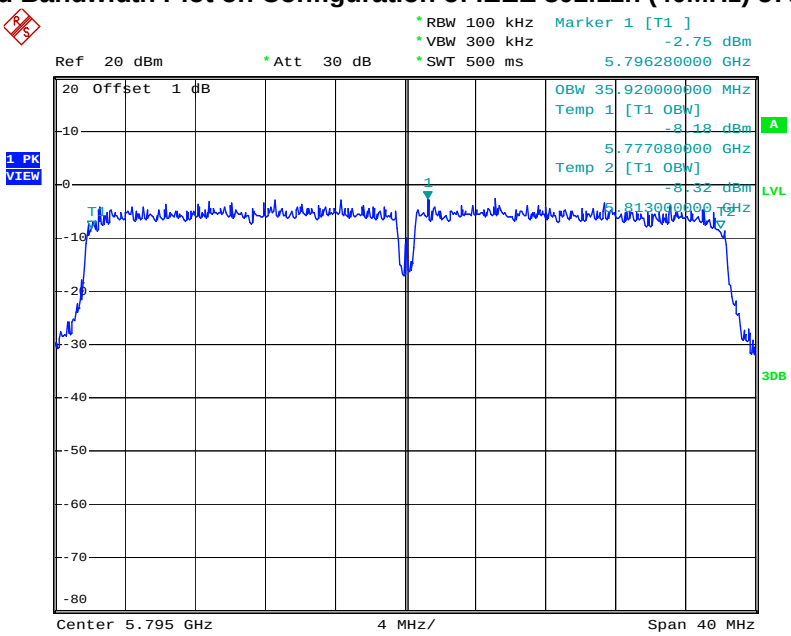
Date: 25.APR.2012 17:10:05

99% Occupied Bandwidth Plot on Configuration of IEEE 802.11n (40MHz) 5755 MHz Port 2



Date: 25.APR.2012 17:15:39

99% Occupied Bandwidth Plot on Configuration of IEEE 802.11n (40MHz) 5795 MHz Port 2



Date: 25.APR.2012 17:19:13

3.5 Radiated Emissions Measurement

3.5.1 Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

Frequencies (MHz)	Field Strength (microvolt/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

3.5.2 Measuring Instruments and Setting

Please refer to section 4 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for peak

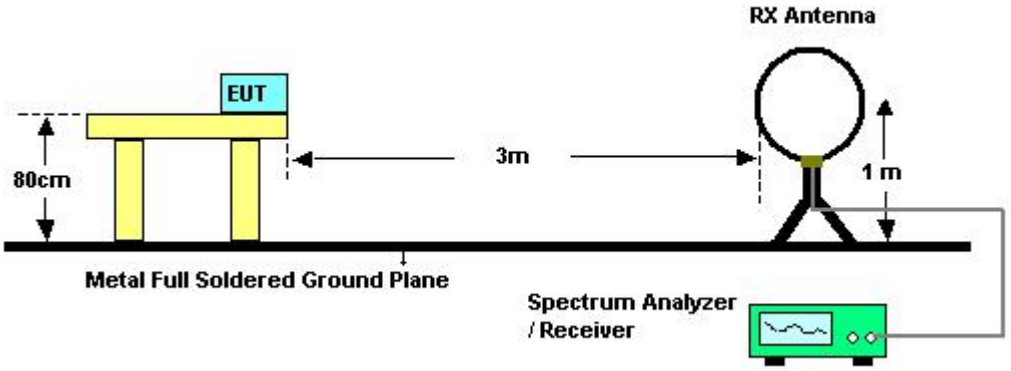
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RB 120kHz for QP

3.5.3 Test Procedures

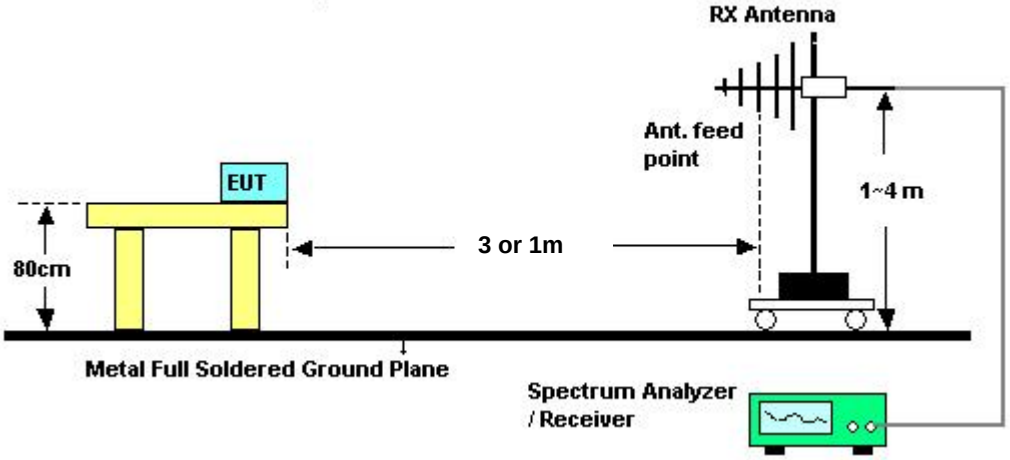
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

3.5.4 Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.
Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

3.5.5 Test Deviation

There is no deviation with the original standard.

3.5.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.5.7 Results of Radiated Emissions (9kHz~30MHz)

Final Test Date	Apr. 11, 2012	**Test Site No.**	03CH02-HY
Temperature	23.9℃	**Humidity**	63%
Test Engineer	Streak		

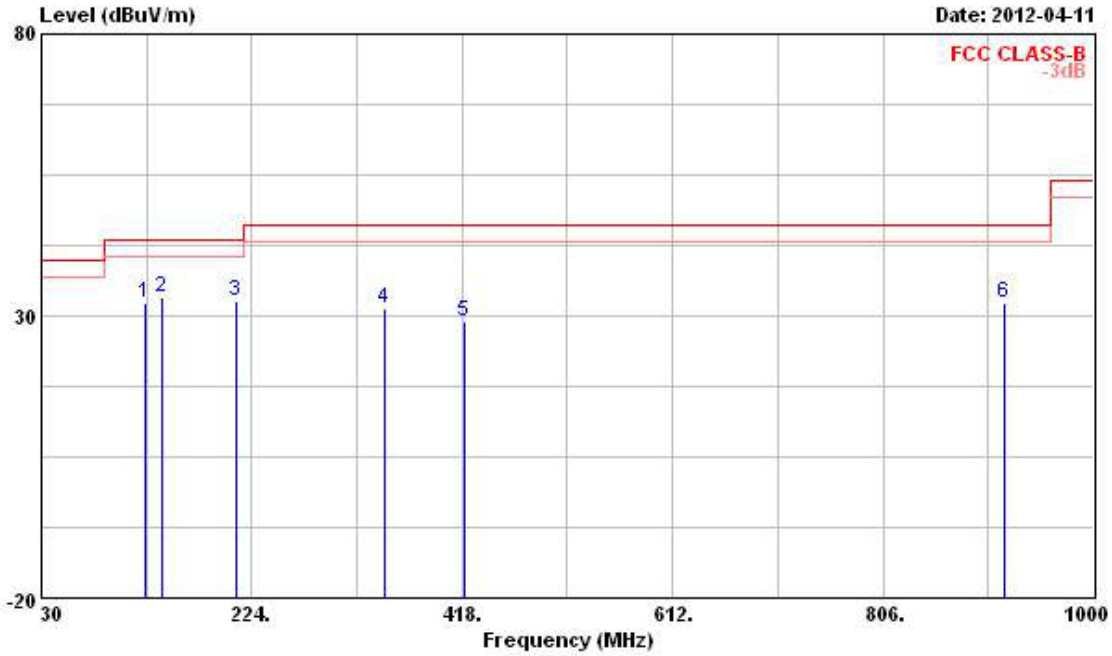
Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:
The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

3.5.8 Results of Radiated Emissions (30MHz~1GHz)

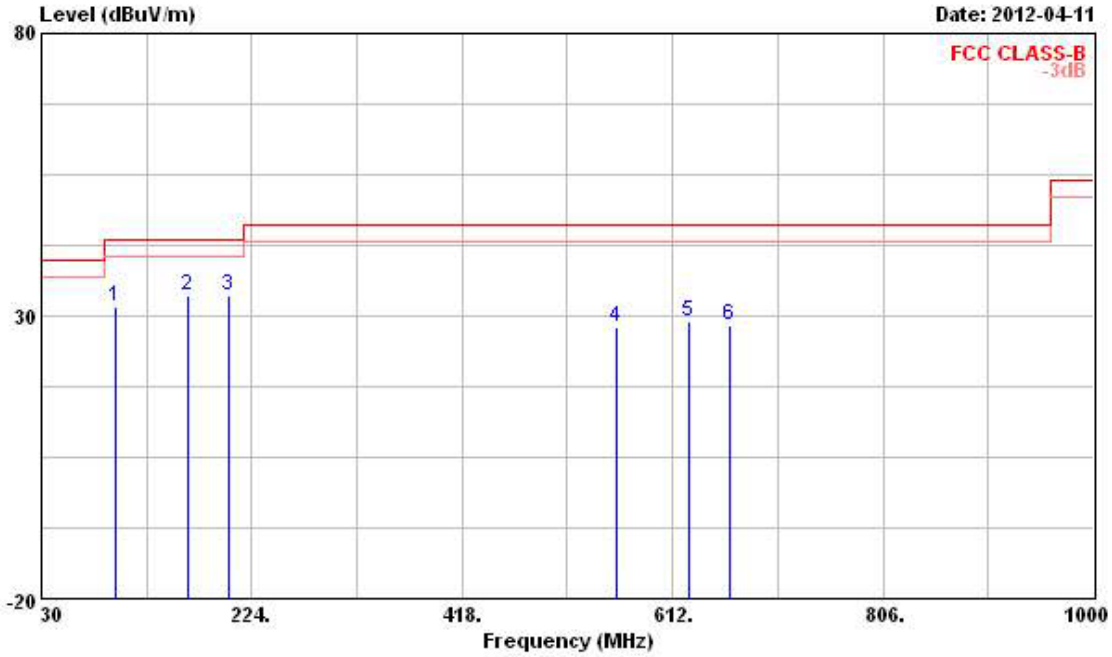
Final Test Date	Apr. 11, 2012	**Test Site No.**	03CH02-HY
Temperature	23.9℃	**Humidity**	63%
Test Engineer	Streak	**Configurations**	System Mode

Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	126.030	32.18	-11.32	43.50	44.95	13.10	1.87	27.74	Peak	---	---
2	141.550	33.13	-10.37	43.50	47.02	11.78	2.00	27.67	Peak	---	---
3	210.420	32.71	-10.79	43.50	45.89	11.70	2.50	27.38	Peak	---	---
4	347.190	31.33	-14.67	46.00	41.22	14.43	3.17	27.49	Peak	---	---
5	419.940	29.02	-16.98	46.00	37.86	15.66	3.47	27.97	Peak	---	---
6	917.550	32.15	-13.85	46.00	33.87	20.46	5.35	27.53	Peak	---	---

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	98.870	31.72	-11.78	43.50	46.91	11.01	1.65	27.85	Peak	---	---
2	164.830	33.49	-10.01	43.50	48.57	10.34	2.14	27.56	Peak	---	---
3	202.660	33.51	-9.99	43.50	47.02	11.45	2.44	27.40	Peak	---	---
4	559.620	27.98	-18.02	46.00	33.32	19.00	4.08	28.42	Peak	---	---
5	626.550	28.94	-17.06	46.00	33.20	19.83	4.32	28.41	Peak	---	---
6	664.380	28.39	-17.61	46.00	32.98	19.32	4.43	28.34	Peak	---	---

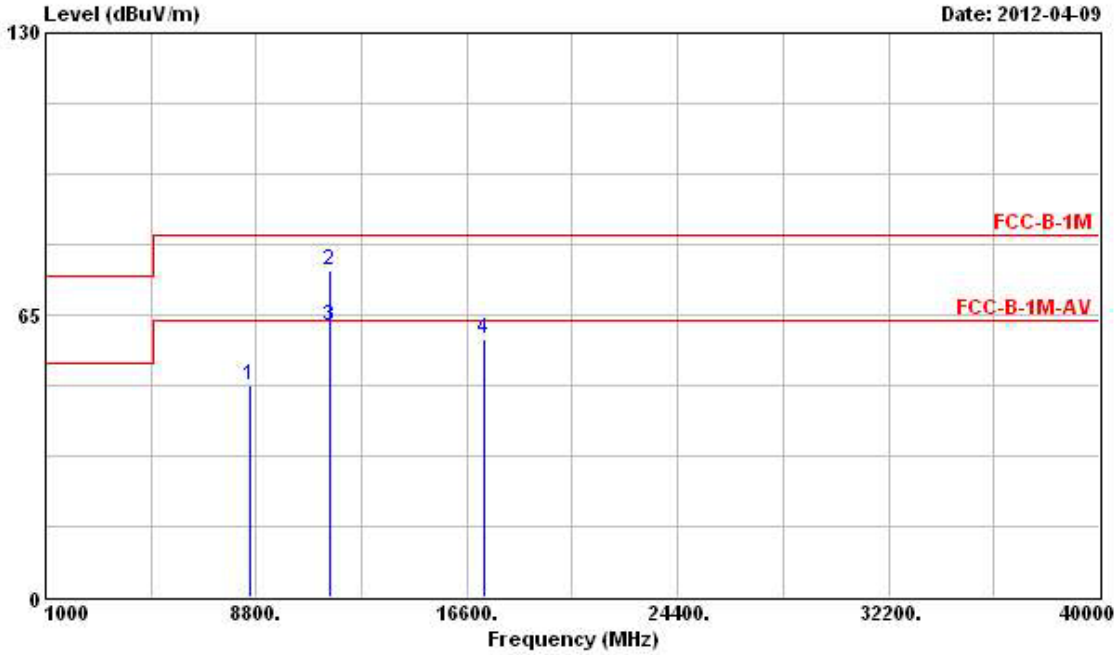
Note:
The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

3.5.9 Results for Radiated Emissions (1GHz~10th Harmonic)

For Single Chain:

Final Test Date	Apr. 09, 2012	**Test Site No.**	03CH02-HY
Temperature	23.9℃	**Humidity**	63%
Test Engineer	Streak	**Configuration**	802.11a Ch. 149

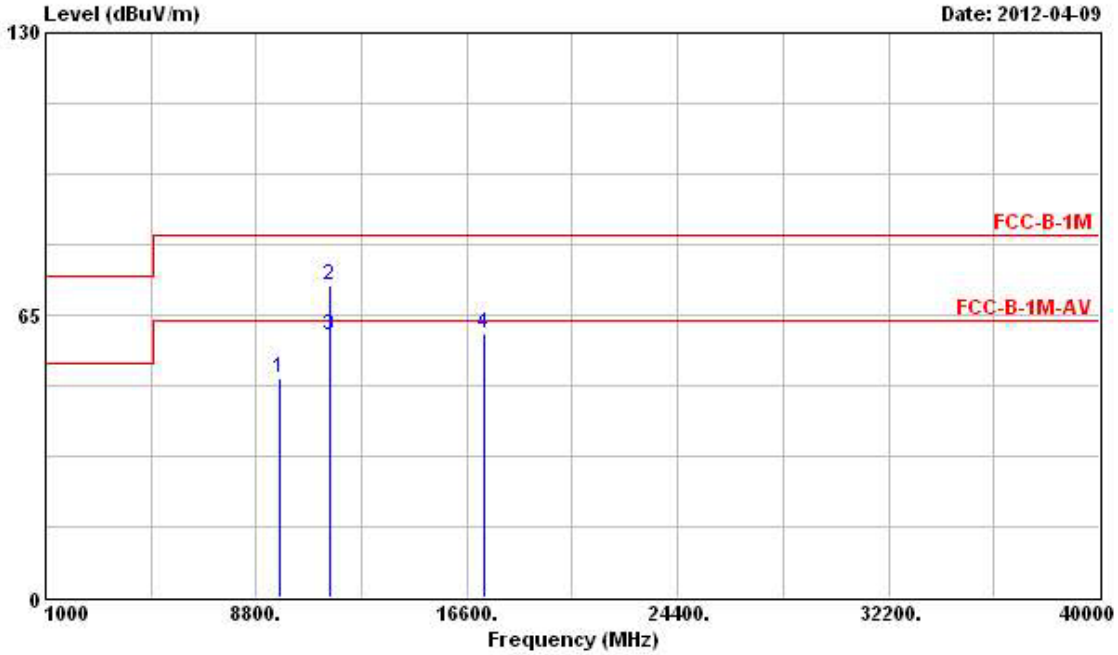
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8568.000	48.88			41.82	36.34	5.97	35.25	Peak	---	---
2	11490.000	75.14	-8.40	83.54	64.34	38.89	6.63	34.72	Peak	---	---
3	11490.000	62.25	-1.29	63.54	51.45	38.89	6.63	34.72	Average	---	---
4	17235.000	59.57			43.39	41.61	8.55	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

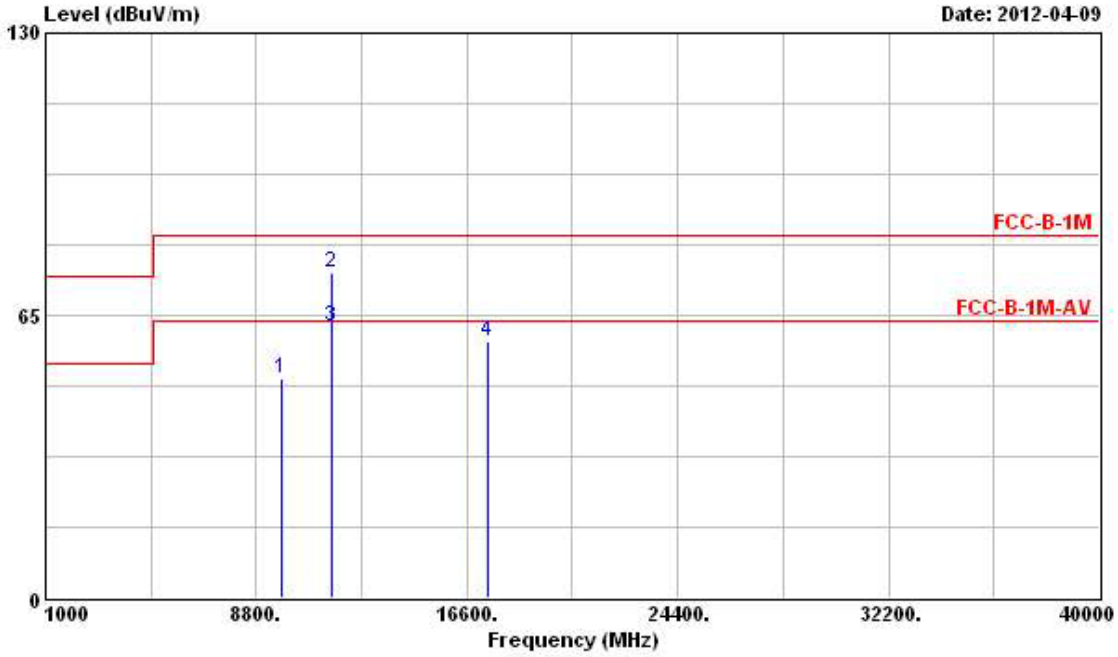


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	9672.000	50.44			42.03	37.54	6.34	35.47	Peak	---	---
2	11490.000	72.00	-11.54	83.54	61.20	38.89	6.63	34.72	Peak	---	---
3	11490.000	60.31	-3.23	63.54	49.51	38.89	6.63	34.72	Average	---	---
4	17235.000	60.87			44.69	41.61	8.55	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Apr. 09, 2012	**Test Site No.**	03CH02-HY
Temperature	23.9℃	**Humidity**	63%
Test Engineer	Streak	**Configuration**	802.11a Ch. 157

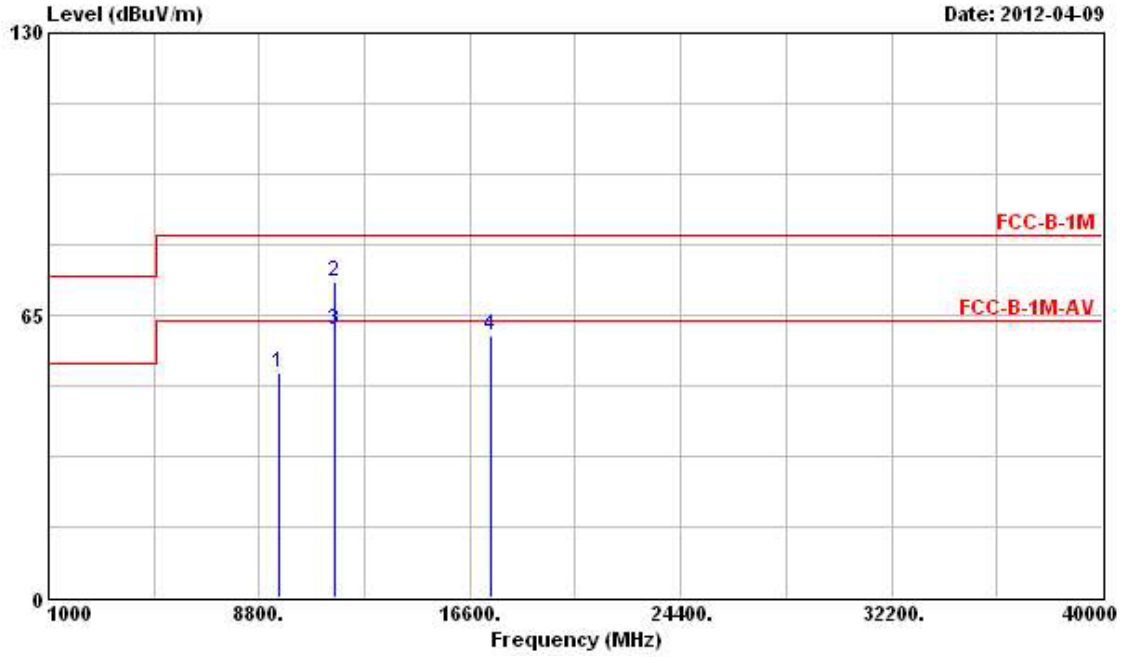
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	9720.000	50.44			41.95	37.61	6.36	35.48	Peak	---	---
2	11570.000	75.02	-8.52	83.54	64.21	38.94	6.63	34.76	Peak	---	---
3	11570.000	62.41	-1.13	63.54	51.60	38.94	6.63	34.76	Average	---	---
4	17355.000	58.91			42.83	41.56	8.50	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

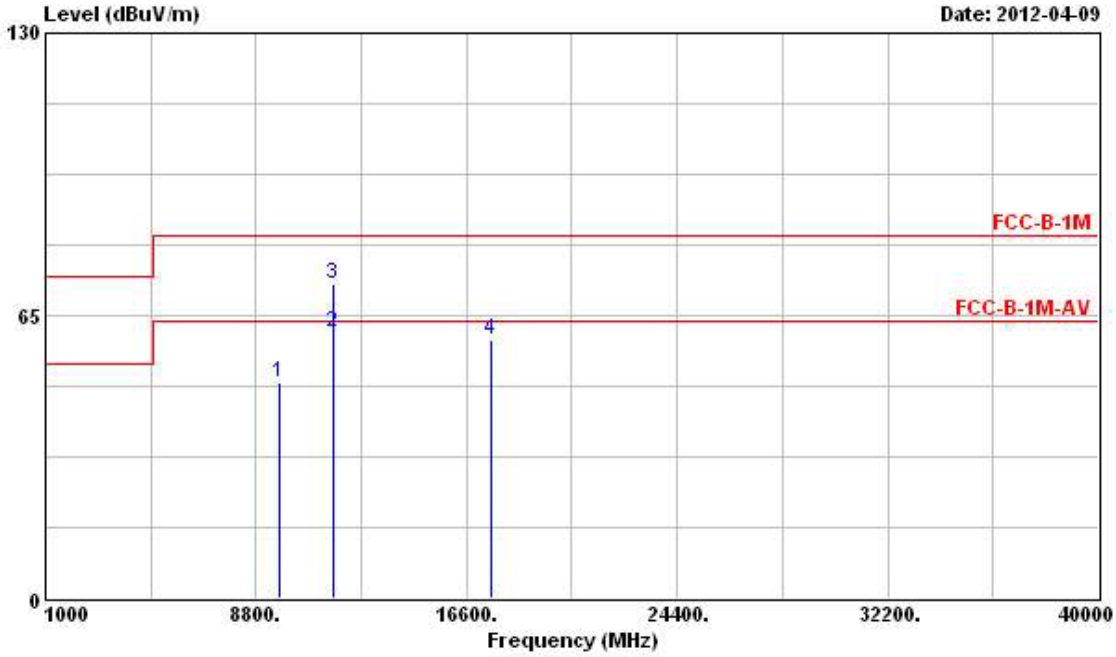


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	9528.000	51.93			43.71	37.35	6.33	35.46	Peak	---	---
2	11570.000	72.87	-10.67	83.54	62.06	38.94	6.63	34.76	Peak	---	---
3	11570.000	61.68	-1.86	63.54	50.87	38.94	6.63	34.76	Average	---	---
4	17355.000	60.11			44.03	41.56	8.50	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Apr. 09, 2012	**Test Site No.**	03CH02-HY
Temperature	23.9℃	**Humidity**	63%
Test Engineer	Streak	**Configuration**	802.11a Ch. 165

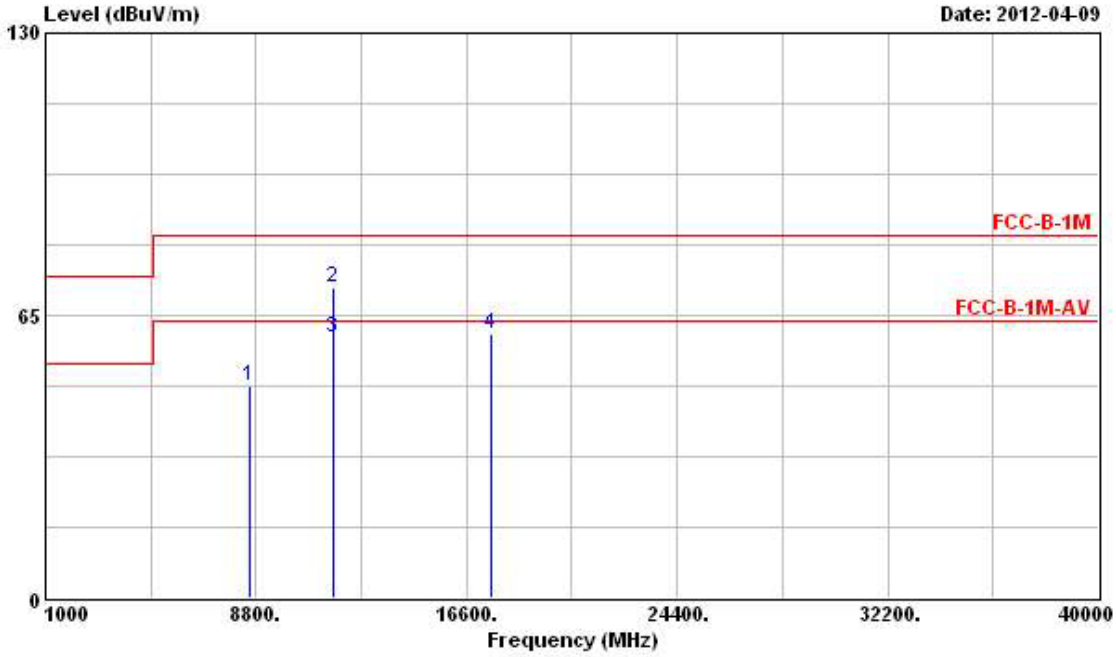
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	9672.000	49.64			41.23	37.54	6.34	35.47	Peak	---	---
2	11650.000	61.17	-2.37	63.54	50.36	38.98	6.64	34.81	Average	---	---
3	11650.000	72.23	-11.31	83.54	61.42	38.98	6.64	34.81	Peak	---	---
4	17475.000	59.61			43.64	41.51	8.44	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical



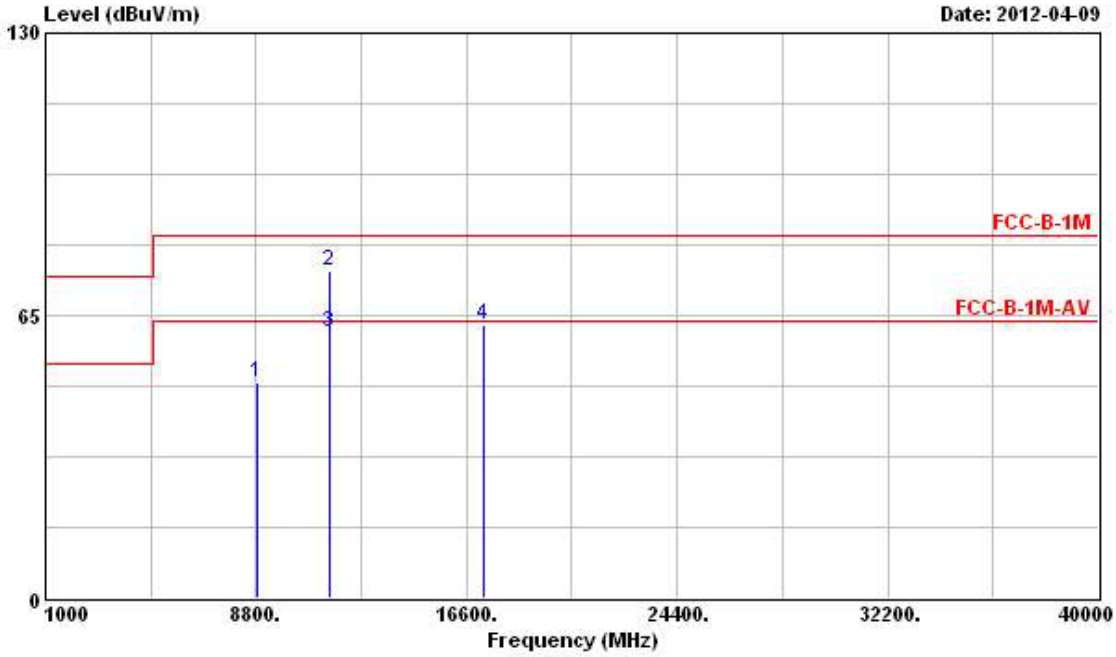
	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8580.000	48.72			41.65	36.35	5.97	35.25	Peak	---	---
2	11650.000	71.53	-12.01	83.54	60.72	38.98	6.64	34.81	Peak	---	---
3	11650.000	59.94	-3.60	63.54	49.13	38.98	6.64	34.81	Average	---	---
4	17475.000	60.81			44.84	41.51	8.44	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

For Two Chains:

Final Test Date	Apr. 09, 2012	**Test Site No.**	03CH02-HY
Temperature	23.9℃	**Humidity**	63%
Test Engineer	Streak	**Configuration**	802.11n Ch. 149 (20MHz)

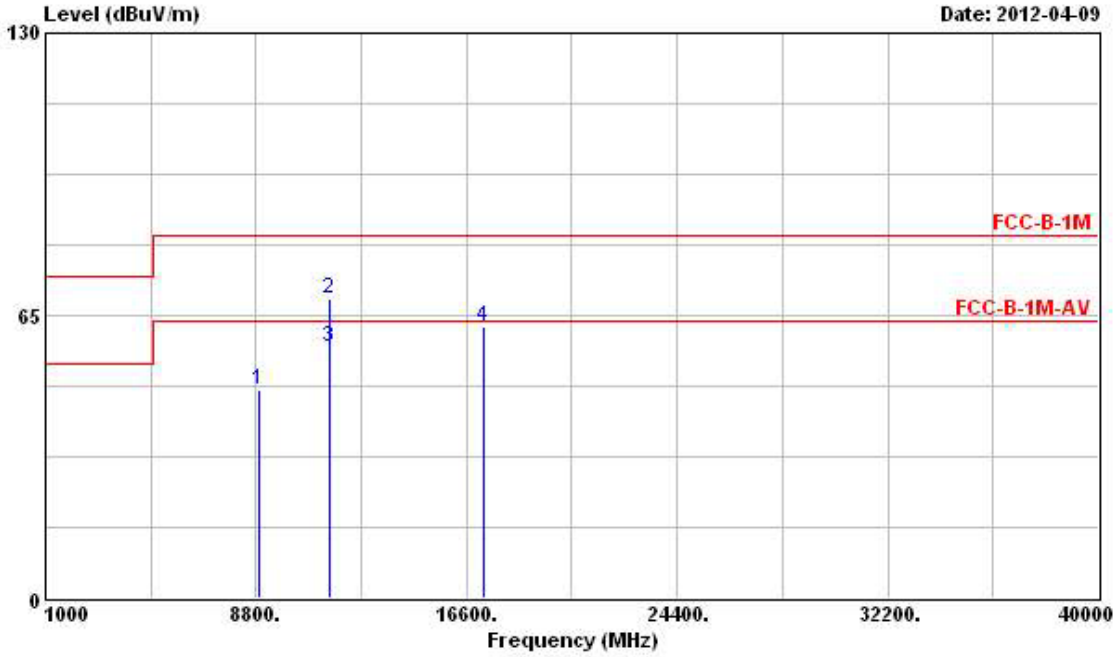
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8808.000	49.40			42.13	36.48	6.08	35.29	Peak	---	---
2	11490.000	75.35	-8.19	83.54	64.55	38.89	6.63	34.72	Peak	---	---
3	11490.000	61.18	-2.36	63.54	50.38	38.89	6.63	34.72	Average	---	---
4	17235.000	63.05			46.87	41.61	8.55	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

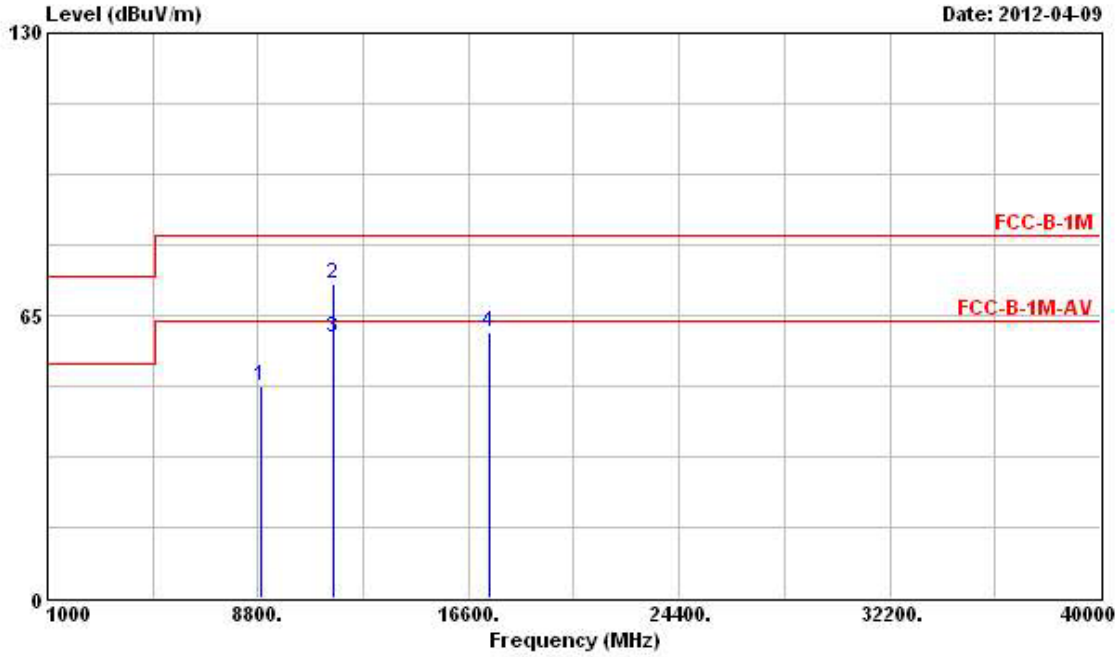


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8904.000	47.73			40.36	36.54	6.13	35.30	Peak	---	---
2	11490.000	69.00	-14.54	83.54	58.20	38.89	6.63	34.72	Peak	---	---
3	11490.000	57.66	-5.88	63.54	46.86	38.89	6.63	34.72	Average	---	---
4	17235.000	62.26			46.08	41.61	8.55	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Apr. 09, 2012	**Test Site No.**	03CH02-HY
Temperature	23.9℃	**Humidity**	63%
Test Engineer	Streak	**Configuration**	802.11n Ch. 157 (20MHz)

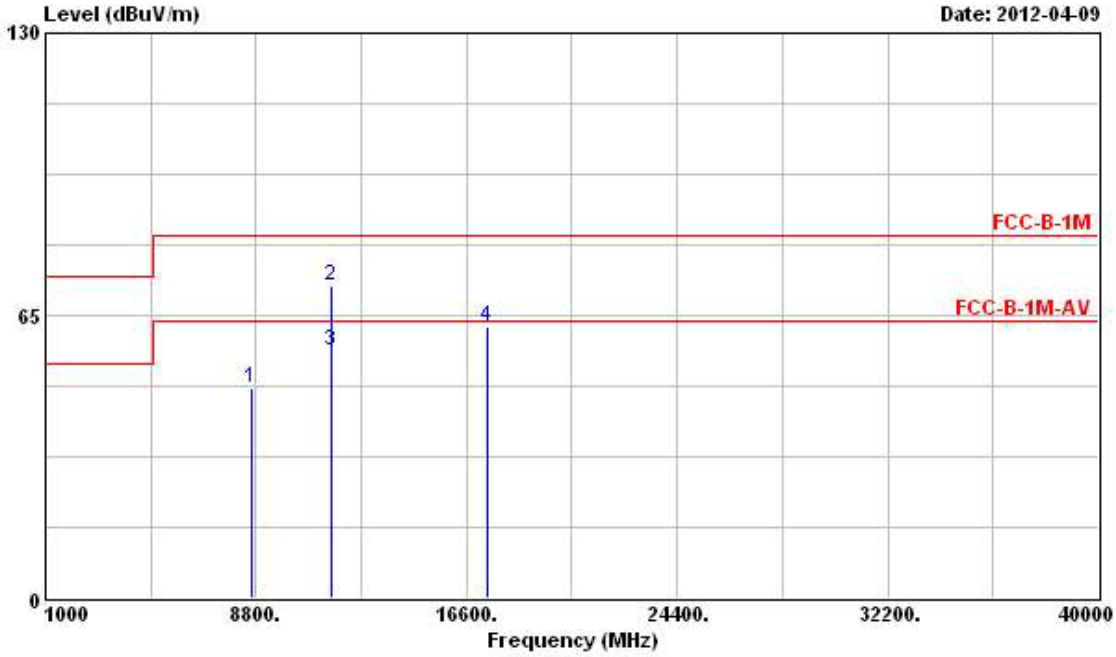
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8880.000	48.62			41.28	36.53	6.11	35.30	Peak	---	---
2	11570.000	72.44	-11.10	83.54	61.63	38.94	6.63	34.76	Peak	---	---
3	11570.000	60.02	-3.52	63.54	49.21	38.94	6.63	34.76	Average	---	---
4	17355.000	61.01			44.93	41.56	8.50	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

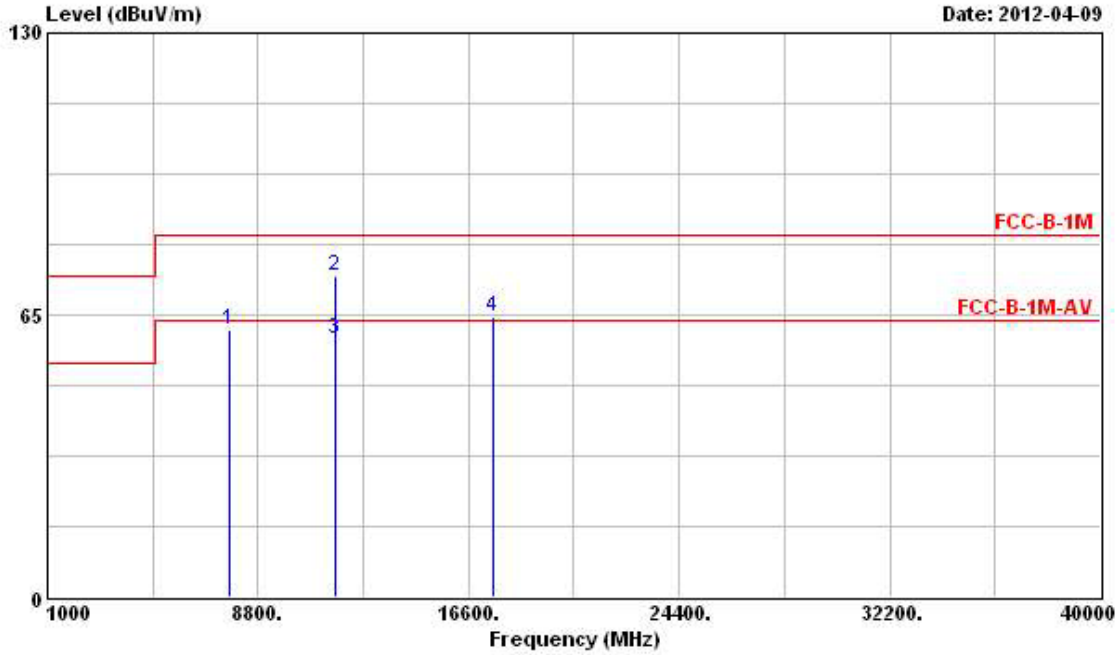


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8616.000	48.49			41.39	36.37	5.99	35.26	Peak	---	---
2	11570.000	71.70	-11.84	83.54	60.89	38.94	6.63	34.76	Peak	---	---
3	11570.000	57.00	-6.54	63.54	46.19	38.94	6.63	34.76	Average	---	---
4	17355.000	62.29			46.21	41.56	8.50	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Apr. 09, 2012	Test Site No.	03CH02-HY
Temperature	23.9℃	Humidity	63%
Test Engineer	Streak	Configuration	802.11n Ch. 165 (20MHz)

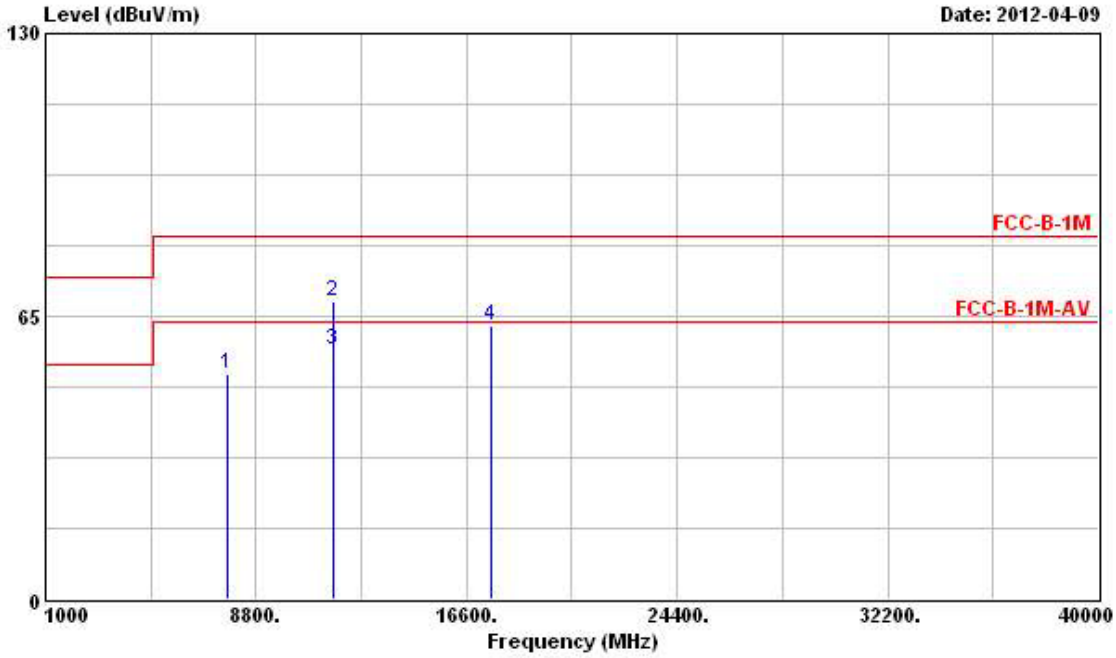
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	7752.000	61.45			55.08	35.85	5.73	35.21	Peak	---	---
2	11650.000	73.77	-9.77	83.54	62.96	38.98	6.64	34.81	Peak	---	---
3	11650.000	59.43	-4.11	63.54	48.62	38.98	6.64	34.81	Average	---	---
4	17475.000	64.54			48.57	41.51	8.44	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

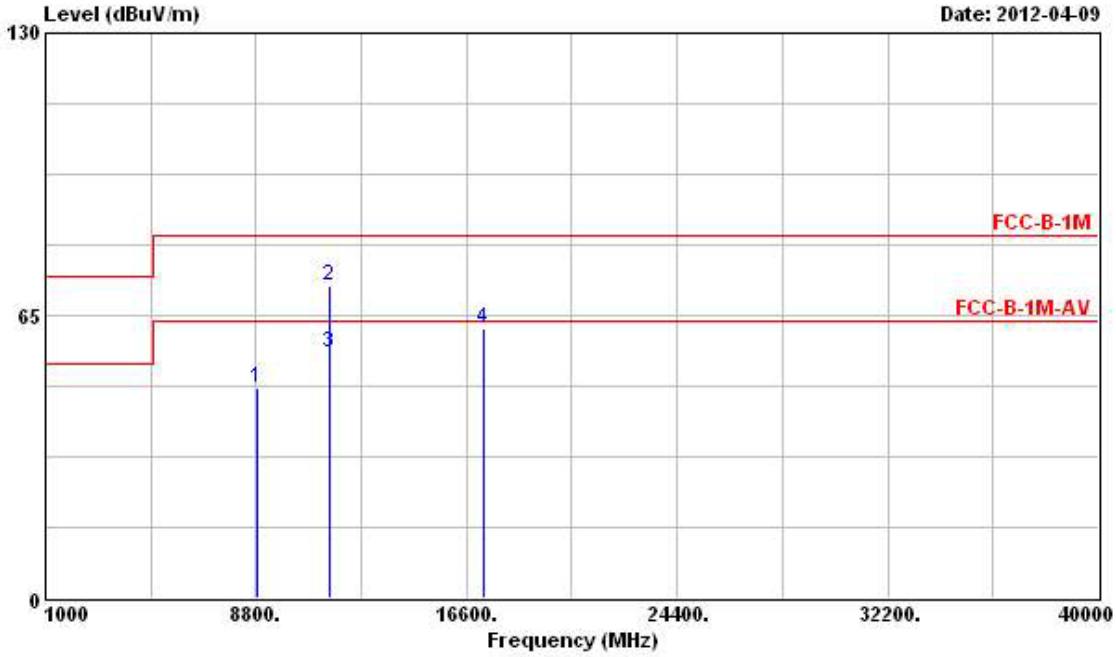


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	7752.000	51.59			45.22	35.85	5.73	35.21	Peak	---	---
2	11650.000	68.62	-14.92	83.54	57.81	38.98	6.64	34.81	Peak	---	---
3	11650.000	57.34	-6.20	63.54	46.53	38.98	6.64	34.81	Average	---	---
4	17475.000	62.69			46.72	41.51	8.44	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Apr. 09, 2012	**Test Site No.**	03CH02-HY
Temperature	23.9℃	**Humidity**	63%
Test Engineer	Streak	**Configuration**	802.11n Ch. 151 (40MHz)

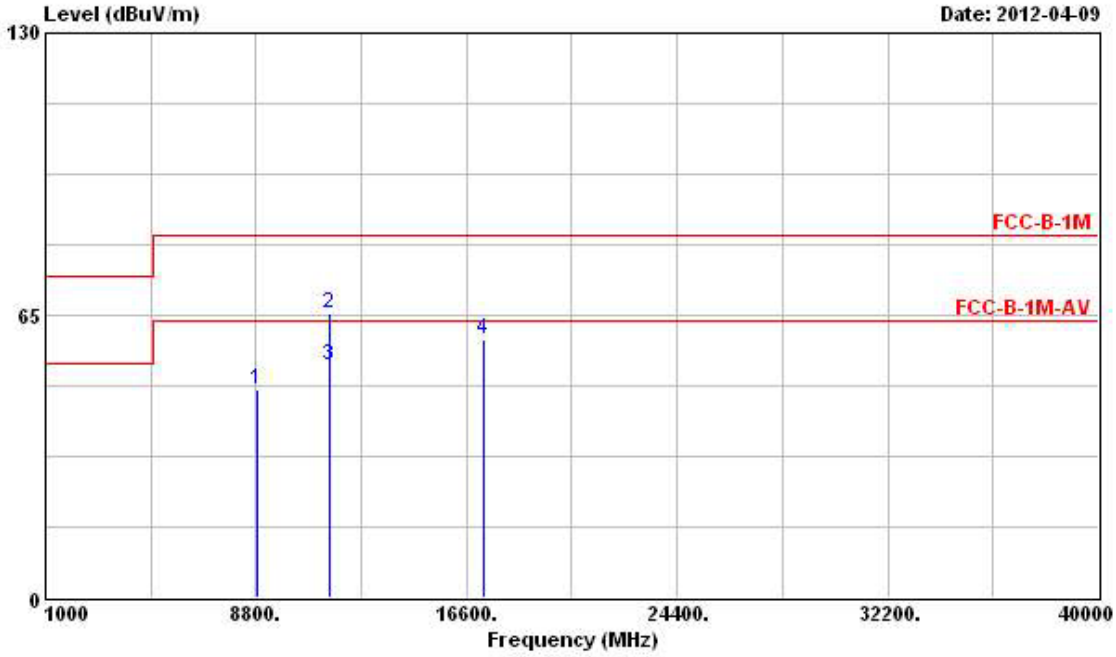
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8820.000	48.37			41.08	36.49	6.09	35.29	Peak	---	---
2	11510.000	71.72	-11.82	83.54	60.91	38.90	6.63	34.72	Peak	---	---
3	11510.000	56.56	-6.98	63.54	45.75	38.90	6.63	34.72	Average	---	---
4	17265.000	62.08			45.93	41.59	8.54	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical

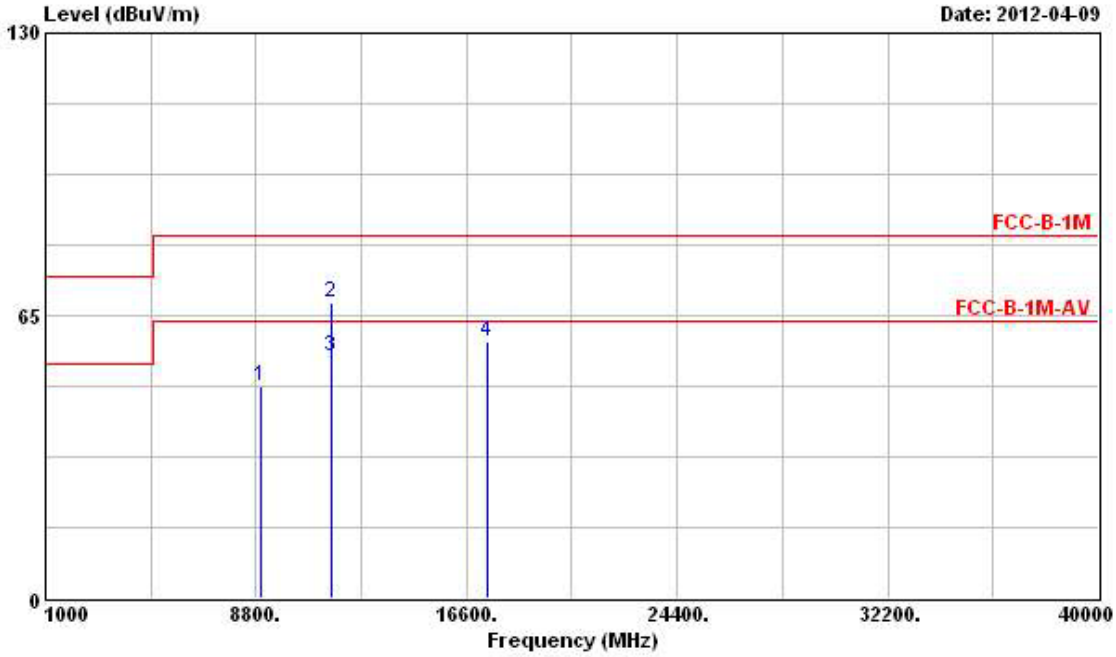


	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8868.000	47.94			40.61	36.52	6.11	35.30	Peak	---	---
2	11510.000	65.24	-18.30	83.54	54.43	38.90	6.63	34.72	Peak	---	---
3	11510.000	53.57	-9.97	63.54	42.76	38.90	6.63	34.72	Average	---	---
4	17265.000	59.52			43.37	41.59	8.54	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Final Test Date	Apr. 09, 2012	**Test Site No.**	03CH02-HY
Temperature	23.9℃	**Humidity**	63%
Test Engineer	Streak	**Configuration**	802.11n Ch. 159 (40MHz)

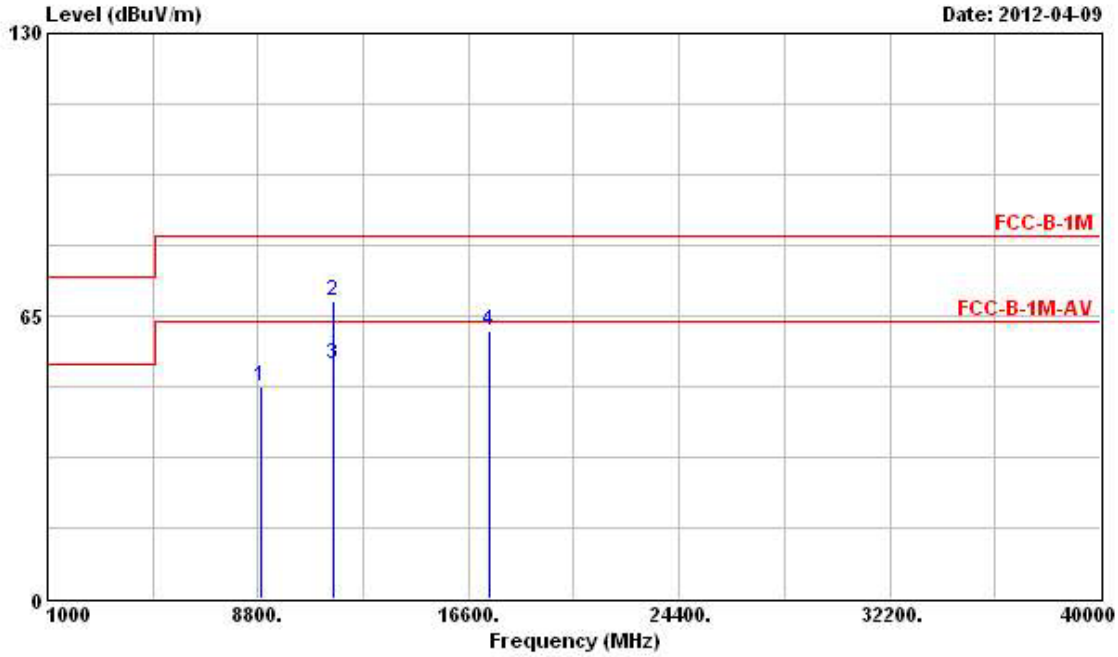
Horizontal



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8964.000	48.82			41.42	36.57	6.14	35.31	Peak	---	---
2	11590.000	67.89	-15.65	83.54	57.07	38.95	6.63	34.76	Peak	---	---
3	11590.000	55.76	-7.78	63.54	44.94	38.95	6.63	34.76	Average	---	---
4	17385.000	58.93			42.88	41.55	8.48	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Vertical



	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	8904.000	48.67			41.30	36.54	6.13	35.30	Peak	---	---
2	11590.000	68.43	-15.11	83.54	57.61	38.95	6.63	34.76	Peak	---	---
3	11590.000	53.79	-9.75	63.54	42.97	38.95	6.63	34.76	Average	---	---
4	17385.000	61.72			45.67	41.55	8.48	33.98	Peak	---	---

Note: The items 1 and 4 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions (see section 3.6.7).

Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

3.6 Band Edge and Fundamental Emissions Measurement

3.6.1 Limit

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter measurement is based on the maximum conducted output power, the attenuation required under this paragraph shall be 30dB instead of 20dB. In addition, radiated emissions which fall in section 15.205(a) the restricted bands must also comply with the radiated emission limit specified in section 15.209(a).

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

3.6.2 Measuring Instruments and Setting

Please refer to section 4 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak

3.6.3 Test Procedures

1. The test procedure is the same as section 3.5.3; only the frequency range investigated is limited to 100MHz around band edges.
2. In case the emission is fail due to the used RB/VB is too wide, marker-delta method of FCC Public Notice DA00-705 will be followed.

3.6.4 Test Setup Layout

This test setup layout is the same as that shown in section 3.5.4.

3.6.5 Test Deviation

There is no deviation with the original standard.

3.6.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

3.6.7 Test Result of Band Edge and Fundamental Emissions

For Single Chain:

Final Test Date	Apr. 09, 2012	**Test Site No.**	03CH02-HY
Temperature	23.9℃	**Humidity**	63%
Test Engineer	Streak	**Configuration**	802.11a Ch. 149, 157, 165

Channel 149

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	5725.000	62.52			22.20	35.28	5.04	0.00	Average	---	---
2 X	5746.810	102.34			61.98	35.29	5.07	0.00	Average	---	---
1	5724.620	76.49			36.17	35.28	5.04	0.00	Peak	---	---
2 X	5741.140	111.55			71.19	35.29	5.07	0.00	Peak	---	---

The item 2 is fundamental emissions and the item 1 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Channel 157

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	5721.590	55.30			14.98	35.28	5.04	0.00	Average	---	---
2 X	5787.380	99.43			59.01	35.33	5.09	0.00	Average	---	---
3	5850.000	54.97			14.48	35.38	5.11	0.00	Average	---	---
1	5704.590	68.57			28.26	35.27	5.04	0.00	Peak	---	---
2 X	5788.910	107.32			66.90	35.33	5.09	0.00	Peak	---	---
3	5854.020	68.24			27.74	35.39	5.11	0.00	Peak	---	---

The item 2 is fundamental emissions and the items 1 and 3 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Channel 165

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 X	5821.770	96.25			55.78	35.36	5.11	0.00	Average	---	---
2	5851.190	54.73			14.24	35.38	5.11	0.00	Average	---	---
1 X	5821.110	105.56			65.09	35.36	5.11	0.00	Peak	---	---
2	5852.350	68.26			27.77	35.38	5.11	0.00	Peak	---	---

The item 1 is fundamental emissions and the item 2 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Note:
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

For Two Chains:

Final Test Date	Apr. 09, 2012	**Test Site No.**	03CH02-HY
Temperature	23.9℃	**Humidity**	63%
Test Engineer	Streak	**Configuration**	802.11n (20MHz) Ch. 149, 157, 165

Channel 149

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	5724.900	60.36			20.04	35.28	5.04	0.00	Average	---	---
2 X	5743.170	100.38			60.02	35.29	5.07	0.00	Average	---	---
1	5724.690	75.66			35.34	35.28	5.04	0.00	Peak	---	---
2 X	5748.490	112.08			71.72	35.29	5.07	0.00	Peak	---	---

The item 2 is fundamental emissions and the item 1 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Channel 157

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	5721.420	55.32			15.00	35.28	5.04	0.00	Average	---	---
2 X	5786.700	99.51			59.09	35.33	5.09	0.00	Average	---	---
3	5852.150	55.00			14.51	35.38	5.11	0.00	Average	---	---
1	5706.630	69.25			28.94	35.27	5.04	0.00	Peak	---	---
2 X	5787.550	111.16			70.74	35.33	5.09	0.00	Peak	---	---
3	5857.420	68.18			27.66	35.39	5.13	0.00	Peak	---	---

The item 2 is fundamental emissions and the items 1 and 3 are on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Channel 165

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 X	5822.430	98.89			58.42	35.36	5.11	0.00	Average	---	---
2	5850.150	55.48			14.99	35.38	5.11	0.00	Average	---	---
1 X	5829.030	110.23			69.76	35.36	5.11	0.00	Peak	---	---
2	5850.970	69.17			28.68	35.38	5.11	0.00	Peak	---	---

The item 1 is fundamental emissions and the item 2 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Final Test Date	Apr. 09, 2012	**Test Site No.**	03CH02-HY
Temperature	23.9℃	**Humidity**	63%
Test Engineer	Streak	**Configuration**	802.11n (40MHz) Ch. 151, 159

Channel 151

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1	5725.000	61.59			21.27	35.28	5.04	0.00	Average	---	---
2 X	5744.300	96.94			56.58	35.29	5.07	0.00	Average	---	---
1	5720.600	74.92			34.60	35.28	5.04	0.00	Peak	---	---
2 X	5751.500	108.52			68.14	35.31	5.07	0.00	Peak	---	---

The item 2 is fundamental emissions and the item 1 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

Channel 159

	Freq	Level	Over Limit	Limit Line	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB		cm	deg
1 X	5778.500	96.08			55.67	35.32	5.09	0.00	Average	---	---
2	5856.400	54.94			14.42	35.39	5.13	0.00	Average	---	---
1 X	5781.300	107.53			67.12	35.32	5.09	0.00	Peak	---	---
2	5867.600	68.37			27.85	35.39	5.13	0.00	Peak	---	---

The item 1 is fundamental emissions and the item 2 is on un-restricted band, so the limit is -20dB for the field strength of the fundamental emissions.

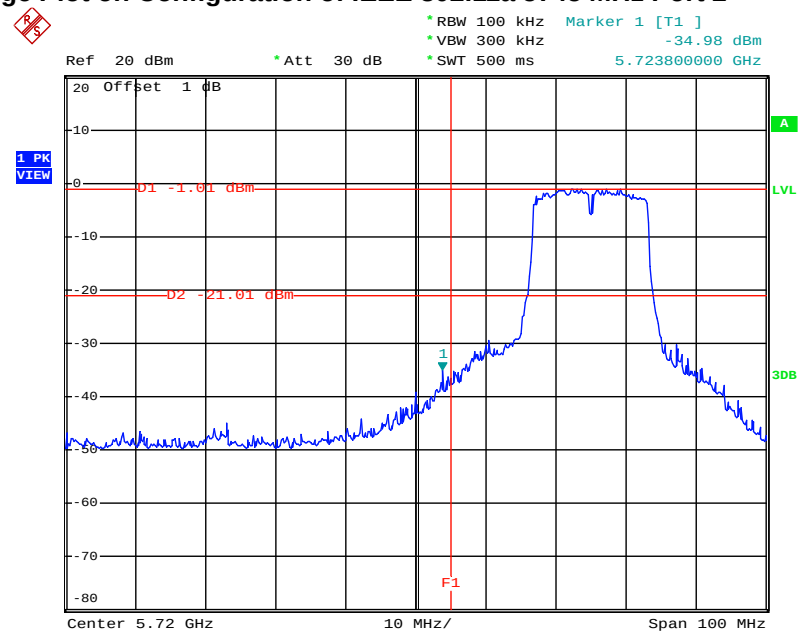
Note:
Emission level (dBuV/m) = 20 log Emission level (uV/m).
Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

For Emission not in Restricted Band

Final Test Date	Apr. 25, 2012	**Test Site No.**	TH01-HY
Temperature	25.9℃	**Humidity**	30%
Test Engineer	Ian	**Configurations**	802.11a/n

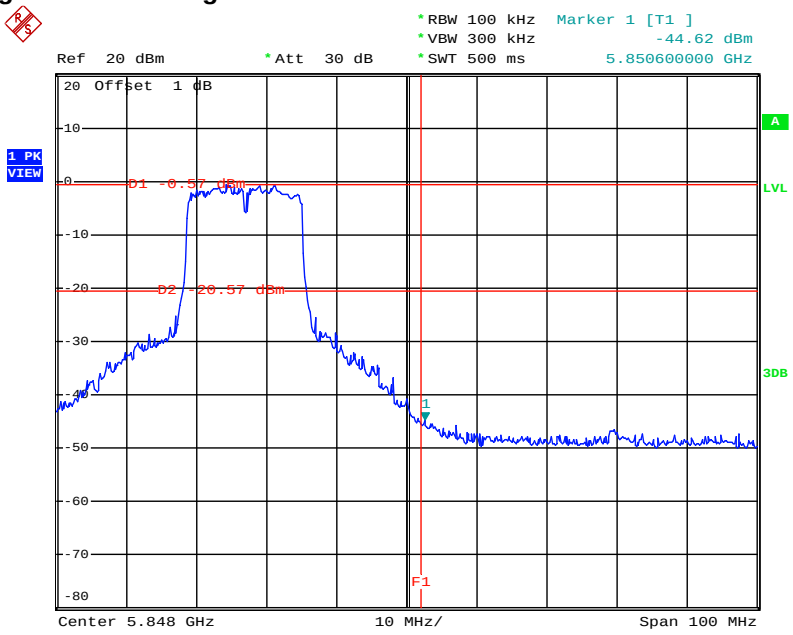
For Single Chain:

Low Band Edge Plot on Configuration of IEEE 802.11a 5745 MHz Port 2



Date: 24.APR.2012 22:09:07

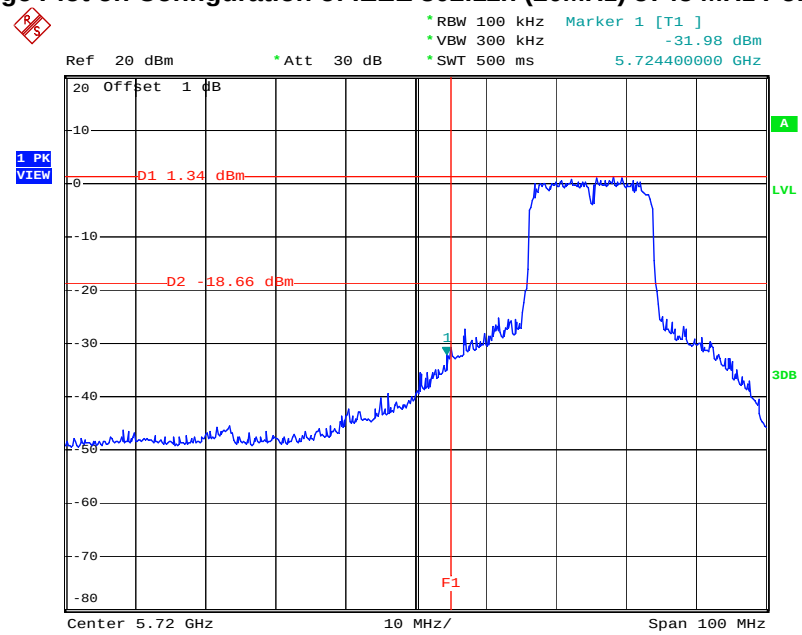
High Band Edge Plot on Configuration of IEEE 802.11a 5825 MHz Port 2



Date: 24.APR.2012 22:14:36

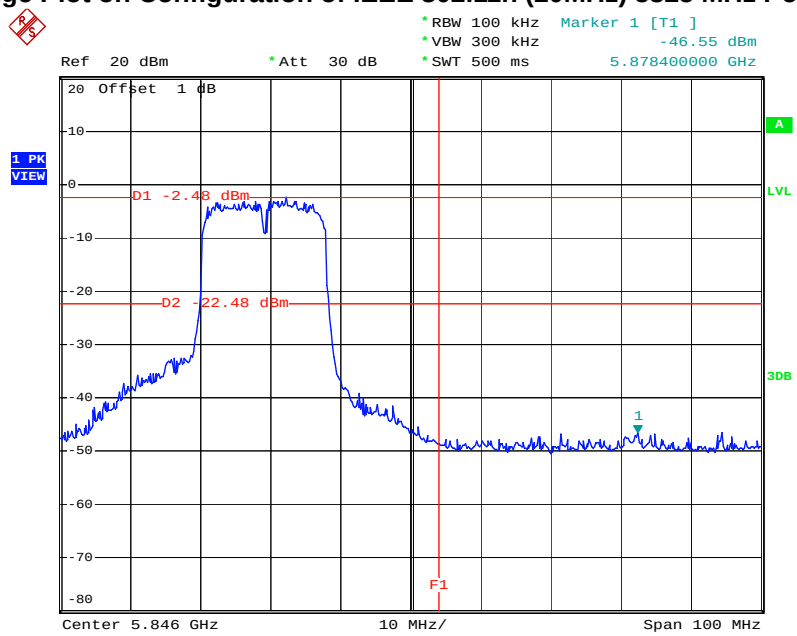
For Two Chains:

Low Band Edge Plot on Configuration of IEEE 802.11n (20MHz) 5745 MHz Port 1



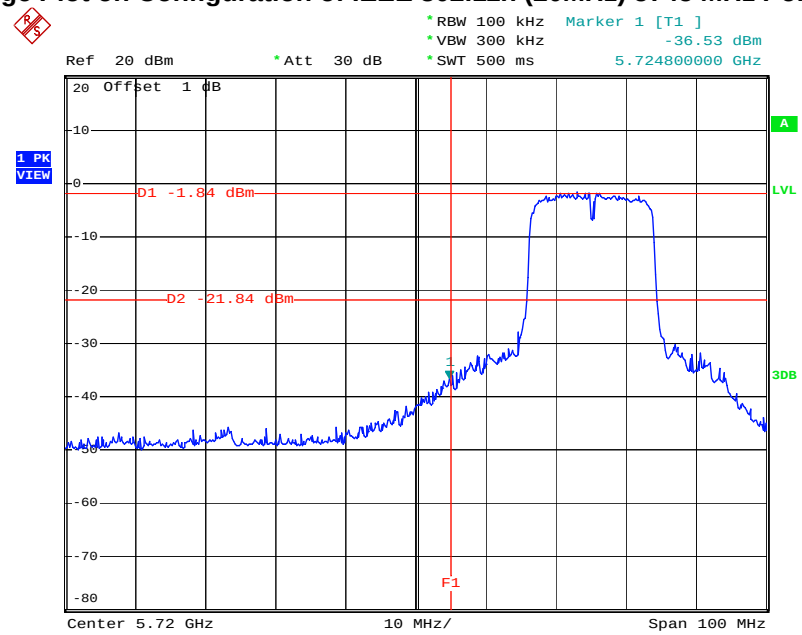
Date: 25.APR.2012 16:39:35

High Band Edge Plot on Configuration of IEEE 802.11n (20MHz) 5825 MHz Port 1



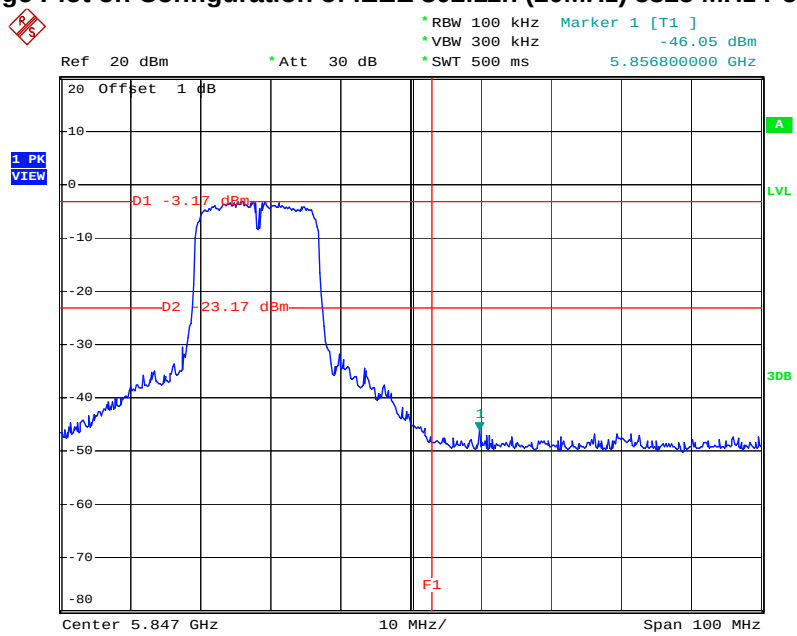
Date: 25.APR.2012 16:45:23

Low Band Edge Plot on Configuration of IEEE 802.11n (20MHz) 5745 MHz Port 2



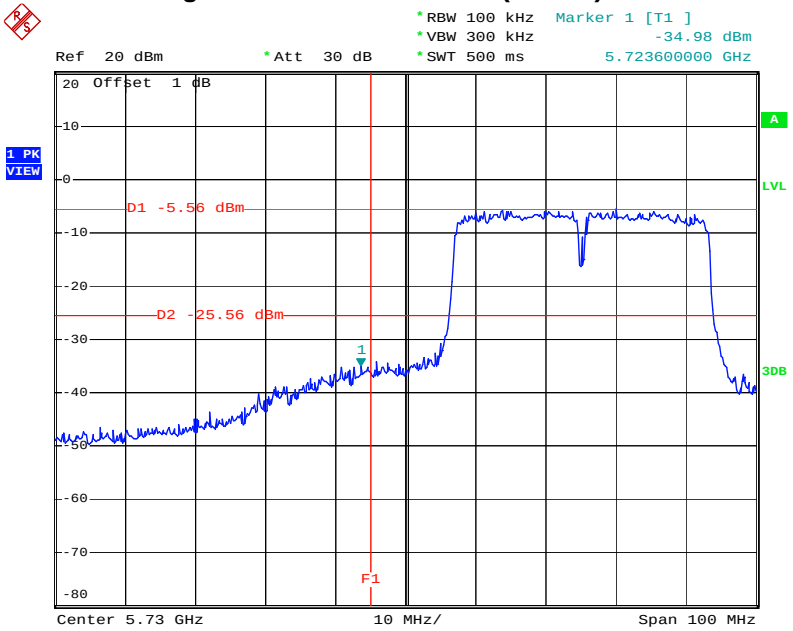
Date: 25.APR.2012 16:51:44

High Band Edge Plot on Configuration of IEEE 802.11n (20MHz) 5825 MHz Port 2



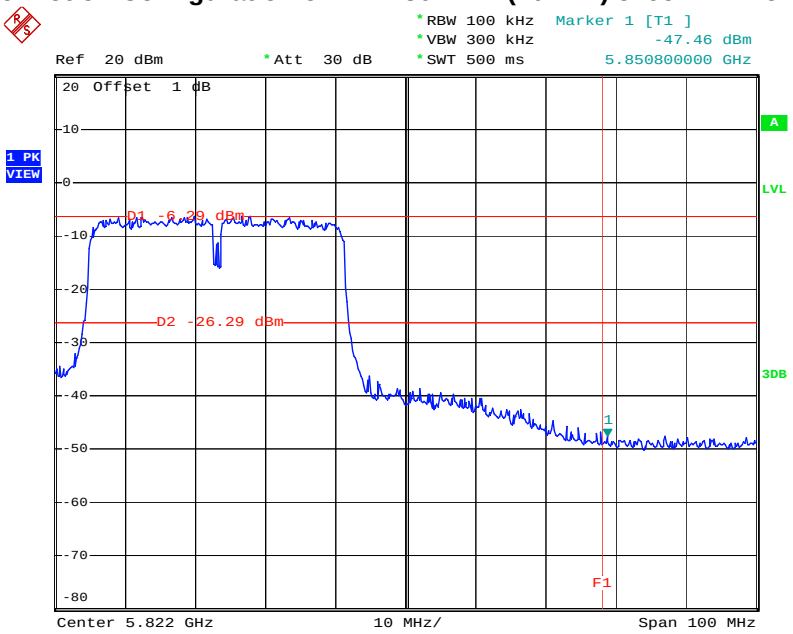
Date: 25.APR.2012 16:57:27

Low Band Edge Plot on Configuration of IEEE 802.11n (40MHz) 5755 MHz Port 1



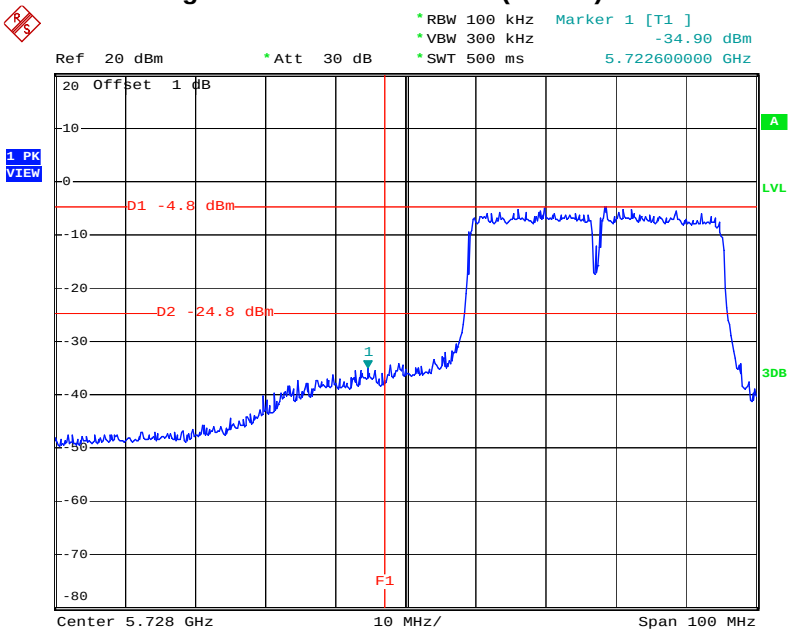
Date: 25.APR.2012 17:07:08

High Band Edge Plot on Configuration of IEEE 802.11n (40MHz) 5795 MHz Port 1



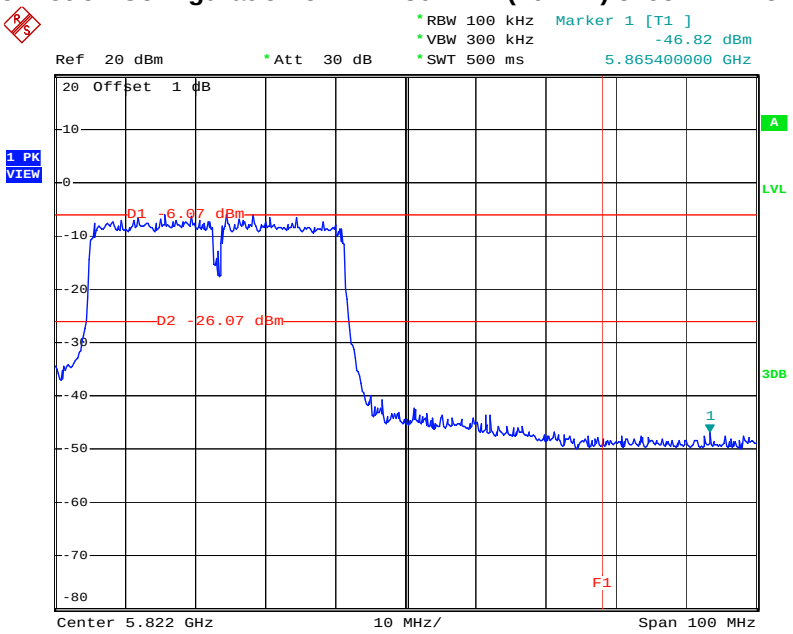
Date: 25.APR.2012 17:10:59

Low Band Edge Plot on Configuration of IEEE 802.11n (40MHz) 5755 MHz Port 2



Date: 25.APR.2012 17:16:21

High Band Edge Plot on Configuration of IEEE 802.11n (40MHz) 5795 MHz Port 2



Date: 25.APR.2012 17:19:55

3.7 Antenna Requirements

3.7.1 Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

3.7.2 Antenna Connector Construction

Please refer to section 2.2 in this test report; antenna connector complied with the requirements.

4 LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100132	9kHz ~ 2.75GHz	Feb. 08, 2012	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001/004	9kHz ~ 30MHz	Jan. 12, 2012	Conduction (CO01-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001/009	9kHz ~ 30MHz	Feb. 20, 2012	Conduction (CO01-HY)
EMI Filter	LINDGREN	LRE-2060	1004	< 450Hz	N/A	Conduction (CO01-HY)
EMI Filter	LINDGREN	N6006	201052	0 ~ 60Hz	N/A	Conduction (CO01-HY)
RF Cable-CON	HUBER+SUHNER	RG213/U	07611832010001	9kHz ~ 30MHz	Mar. 02, 2012	Conduction (CO01-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP 40	100305	9KHz ~ 40GHz	Feb. 21, 2012	Conducted (TH01-HY)
DC Power Source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Jun. 03, 2011	Conducted (TH01-HY)
Temp. and Humidity Chamber	Giant Force	GTH-225-20-SP-SD	MAA1112-007	-20 ~ 100℃	Dec. 07, 2011	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Jun. 07, 2011	Conducted (TH01-HY)
Power Sensor	Anritsu	MA2411B	1027452	300MHz ~ 40GHz	Jun. 16, 2011	Conducted (TH01-HY)
Power Meter	Anritsu	ML2495A	1124009	300MHz ~ 40GHz	Jun. 20, 2011	Conducted (TH01-HY)
RF Cable-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Dec. 03, 2011	Conducted (TH01-HY)
RF Cable-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Dec. 03, 2011	Conducted (TH01-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
AC Power Source	HPC	HPA-500W	HPA-9100024	AC 0 ~ 300V	Jun. 09, 2011*	Conducted (TH01-HY)

Note: Calibration Interval of instruments listed above is two year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	R&S	FSP40	100593	9kHz ~ 40GHz	Aug. 08, 2011	Radiation (03CH02-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz ~ 1GHz 3m	May 11, 2011	Radiation (03CH02-HY)
Amplifier	Agilent	8447D	2944A11146	100kHz ~ 1.3GHz	Jul. 25, 2011	Radiation (03CH02-HY)
Amplifier	Agilent	8449B	3008A02373	1 Hz ~ 26.5GHz	Jul. 25, 2011	Radiation (03CH02-HY)
Horn Antenna	ETS-LINDGREN	3117	00091920	1GHz ~ 18GHz	Nov. 15, 2011	Radiation (03CH02-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz ~ 1GHz	Nov. 11, 2011	Radiation (03CH02-HY)
RF Cable-high	SUHNER	SUCOFLEX106	03CH02-HY	1GHz ~ 40GHz	Mar. 06, 2012	Radiation (03CH02-HY)
Bilog Antenna	SCHAFFNER	CBL61128	2723	30MHz ~ 2GHz	Oct. 22, 2011	Radiation (03CH02-HY)
Turn Table	HD	DS 420	420/649/00	0~ 360 degree	N/A	Radiation (03CH02-HY)
Antenna Mast	HD	MA 240	240/559/00	1 ~ 4 m	N/A	Radiation (03CH02-HY)

Note: Calibration Interval of instruments listed above is one year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Loop Antenna	R&S	HFH2-Z2	860004/001	9kHz ~ 30MHz	Jul. 29, 2010*	Radiation (03CH02-HY)

Note: Calibration Interval of instruments listed above is two year.

5 TEST LOCATION

SHIJR	ADD	:	6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei 221, Taiwan, R.O.C.
	TEL	:	886-2-2696-2468
	FAX	:	886-2-2696-2255
HWA YA	ADD	:	No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
	TEL	:	886-3-327-3456
	FAX	:	886-3-327-0973
LINKOU	ADD	:	No. 30-2, Dingfu Vil., Linkou Dist., New Taipei City 244, Taiwan, R.O.C.
	TEL	:	886-2-2601-1640
	FAX	:	886-2-2601-1695
DUNGHU	ADD	:	No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei 114, Taiwan, R.O.C.
	TEL	:	886-2-2631-4739
	FAX	:	886-2-2631-9740
JUNGHE	ADD	:	7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei 235, Taiwan, R.O.C.
	TEL	:	886-2-8227-2020
	FAX	:	886-2-8227-2626
NEIHU	ADD	:	4Fl., No. 339, Hsin Hu 2nd Rd., Taipei 114, Taiwan, R.O.C.
	TEL	:	886-2-2794-8886
	FAX	:	886-2-2794-9777
JHUBEI	ADD	:	No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C.
	TEL	:	886-3-656-9065
	FAX	:	886-3-656-9085

6 TAF CERTIFICATE OF ACCREDITATION

Certificate No. : L1190-111208

財團法人全國認證基金會
Taiwan Accreditation Foundation

Certificate of Accreditation

This is to certify that

Sporton International Inc.
EMC & Wireless Communications Laboratory
No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

is accredited in respect of laboratory

Accreditation Criteria	:	ISO/IEC 17025:2005
Accreditation Number	:	1190
Originally Accredited	:	December 15, 2003
Effective Period	:	January 10, 2010 to January 09, 2013
Accredited Scope	:	Testing Field, see described in the Appendix
Specific Accreditation Program	:	Accreditation Program for Designated Testing Laboratory for Commodities Inspection Accreditation Program for Telecommunication Equipment Testing Laboratory Accreditation Program for BSMI Mutual Recognition Arrangment with Foreign Authorities

Jay-San Chen
President, Taiwan Accreditation Foundation
Date : December 08, 2011

P1, total 24 pages

The Appendix forms an integral part of this Certificate, which shall be invalid when use without the Appendix

Appendix A. RF Exposure Evaluation

1. Maximum Permissible Exposure

1.1. Applicable Standard

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|²,|H|² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm²)	Averaging Time |E|²,|H|² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

1.2. MPE Calculation Method

E (V/m) = $\frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (W/m²) = $\frac{E^2}{377}$

E = Electric field (V/m)
P = Peak RF output power (W)
G = EUT Antenna numeric gain (numeric)
d = Separation distance between radiator and human body (m)
The formula can be changed to

Pd = $\frac{30 \times P \times G}{377 \times d^2}$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

1.3. Calculated Result and Limit

Antenna Type : Printed Antenna
For Single Chain:
Max Conducted Power for IEEE 802.11a: 20.29dBm

Test Frequency (MHz)	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5745	20	6.64	4.613176	20.29	106.9055	**0.0982**

For Two Chain:
Max Conducted Power for IEEE 802.11n: 24.32dBm

Test Frequency (MHz)	Min. User Distance (cm)	Gain (dBi)	Numeric Gain	Conducted Power (dBm)	Conducted Power (mW)	Power Density (mW/cm2)
5745	20	6.64	4.613176	24.32	270.3958	**0.2483**

Appendix B. Test Photos

1 Photographs of Conducted Emissions Test Configuration

FRONT VIEW

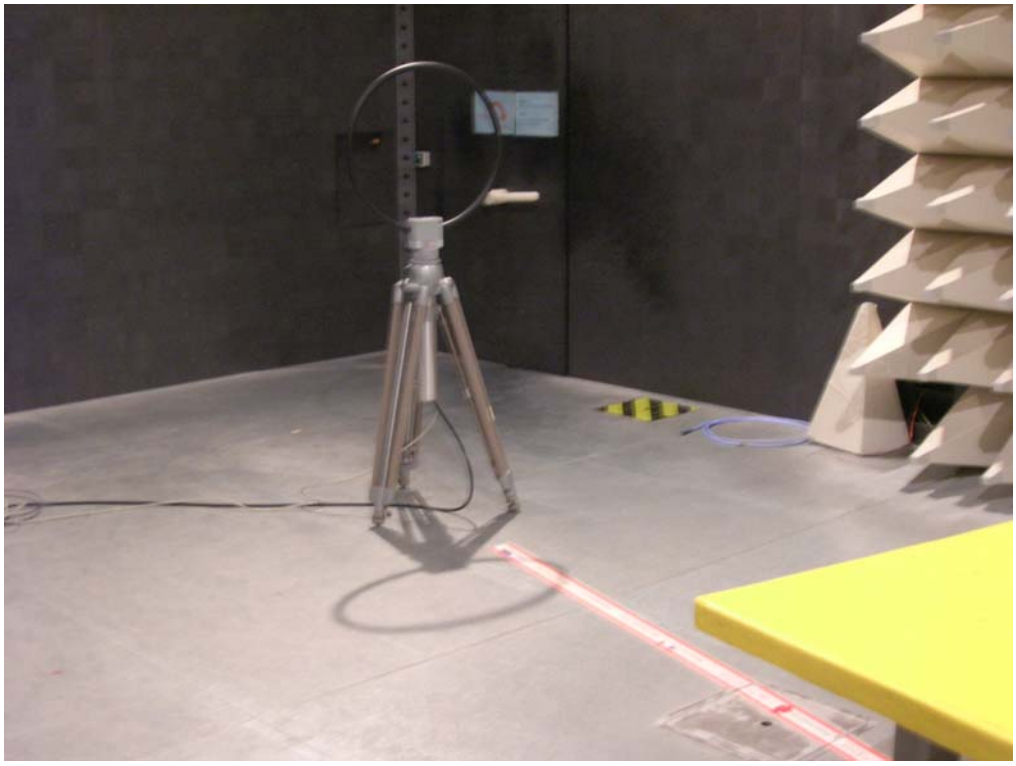
REAR VIEW

SIDE VIEW

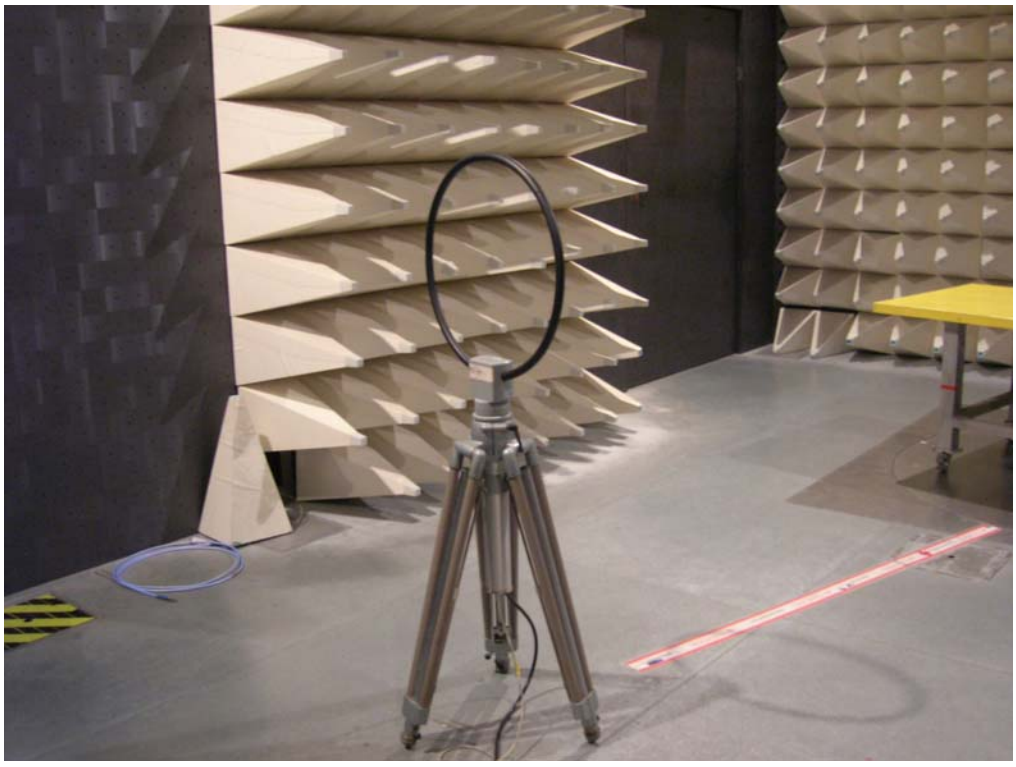
2 Photographs of Radiated Emissions Test Configuration

For radiated emissions 9kHz~30MHz

FRONT VIEW

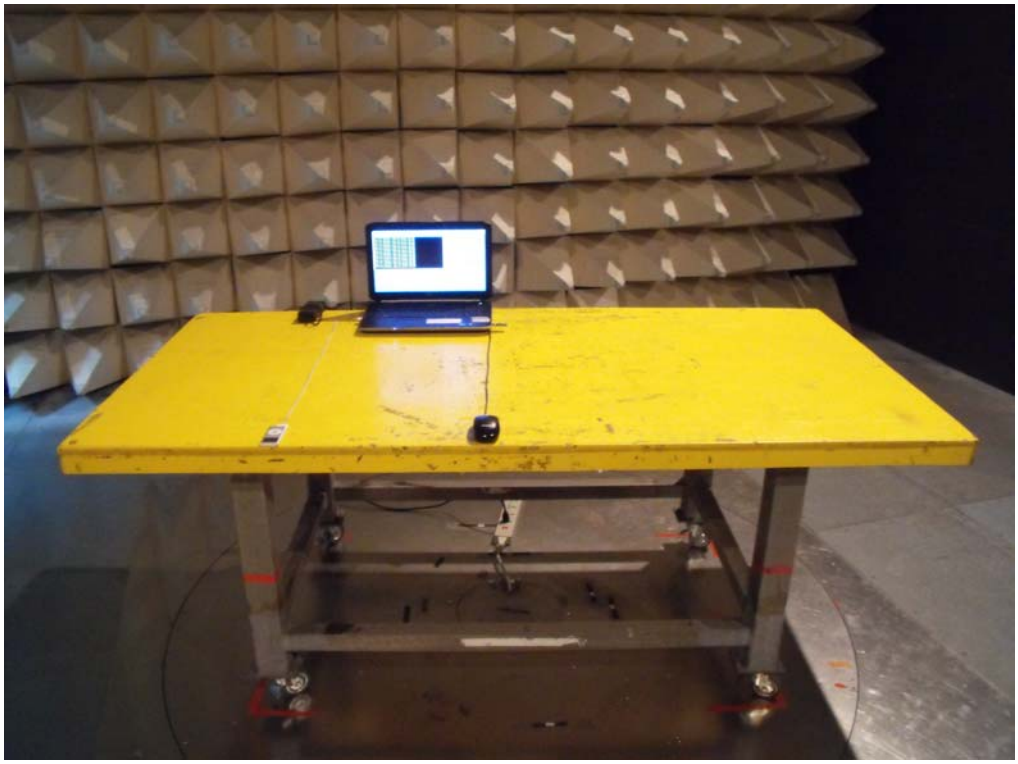


REAR VIEW

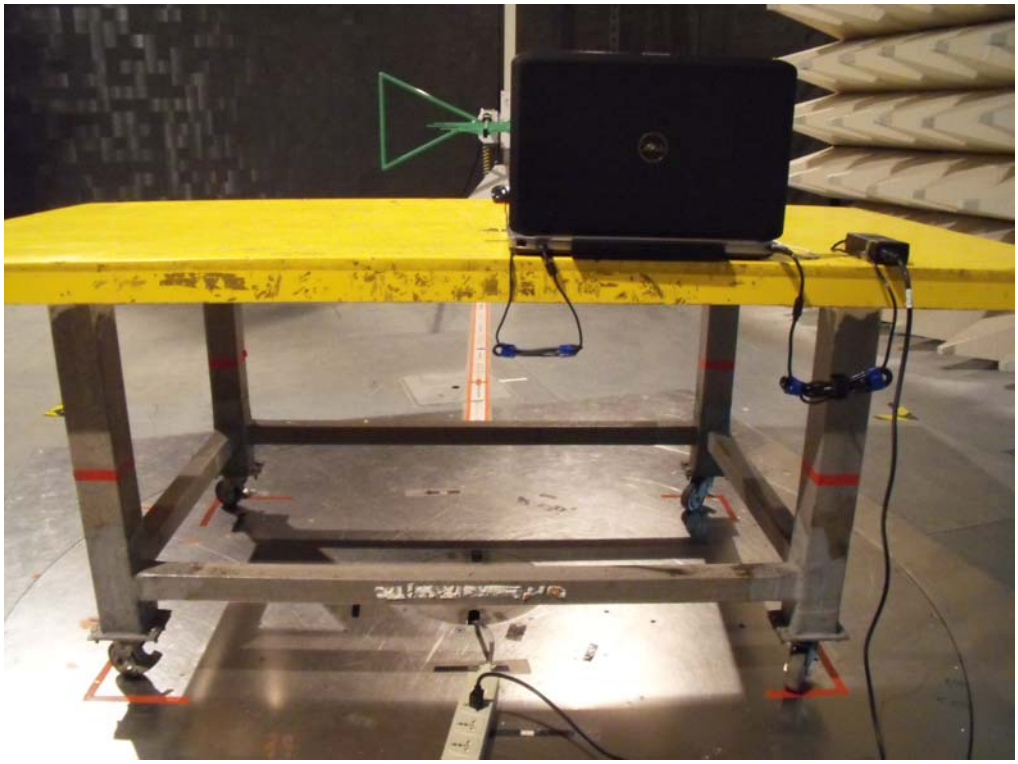


For radiated emissions 30MHz~1GHz

FRONT VIEW

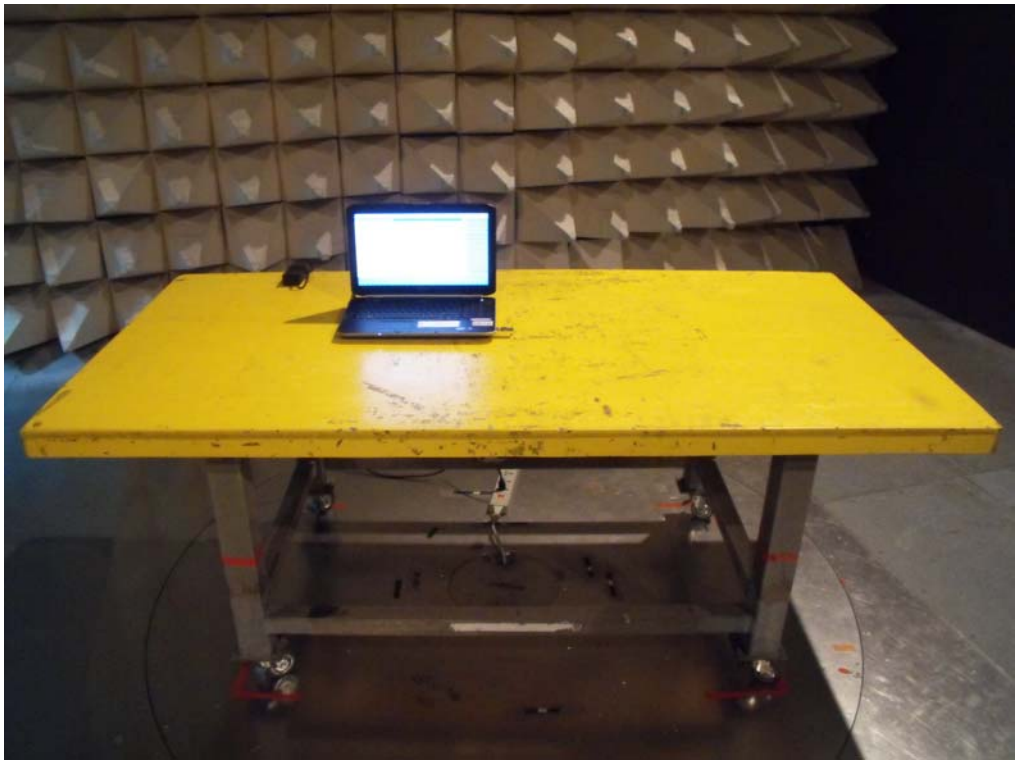


REAR VIEW

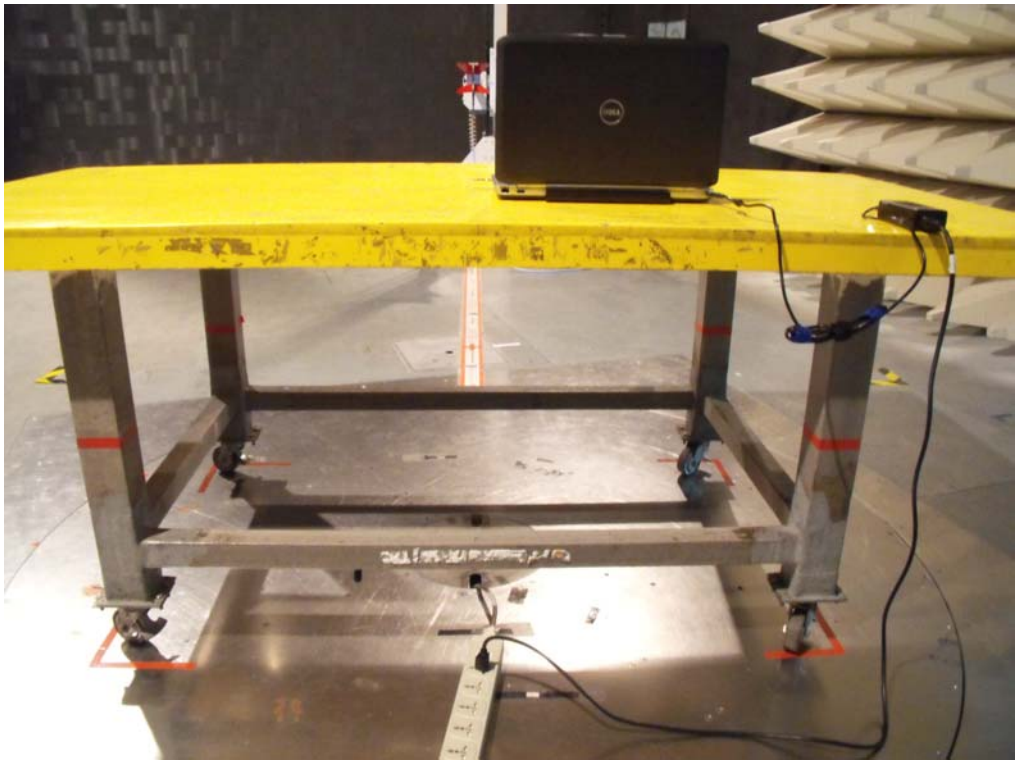


For radiated emissions above 1GHz

FRONT VIEW



REAR VIEW

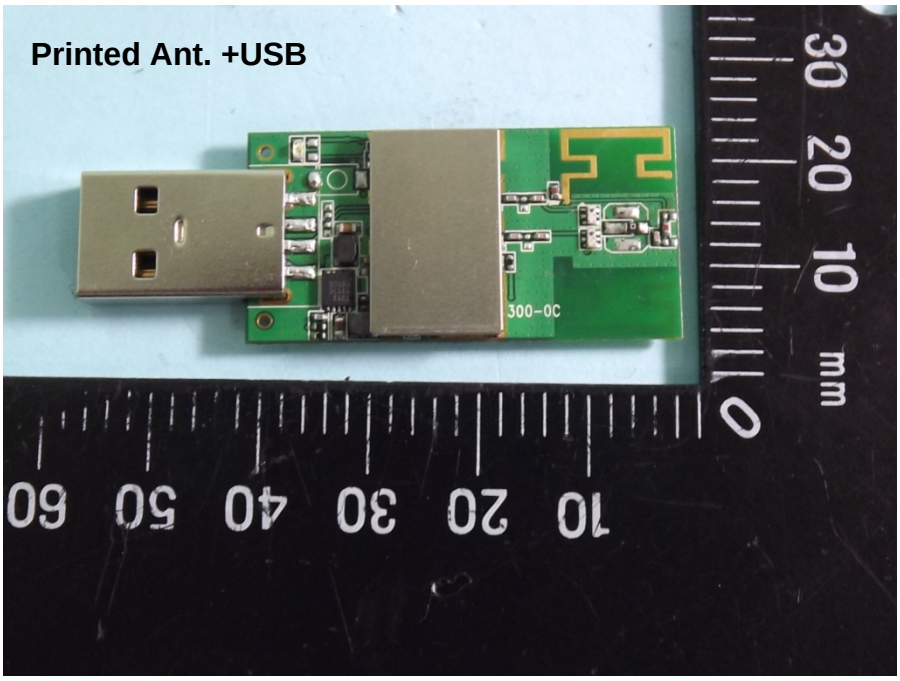


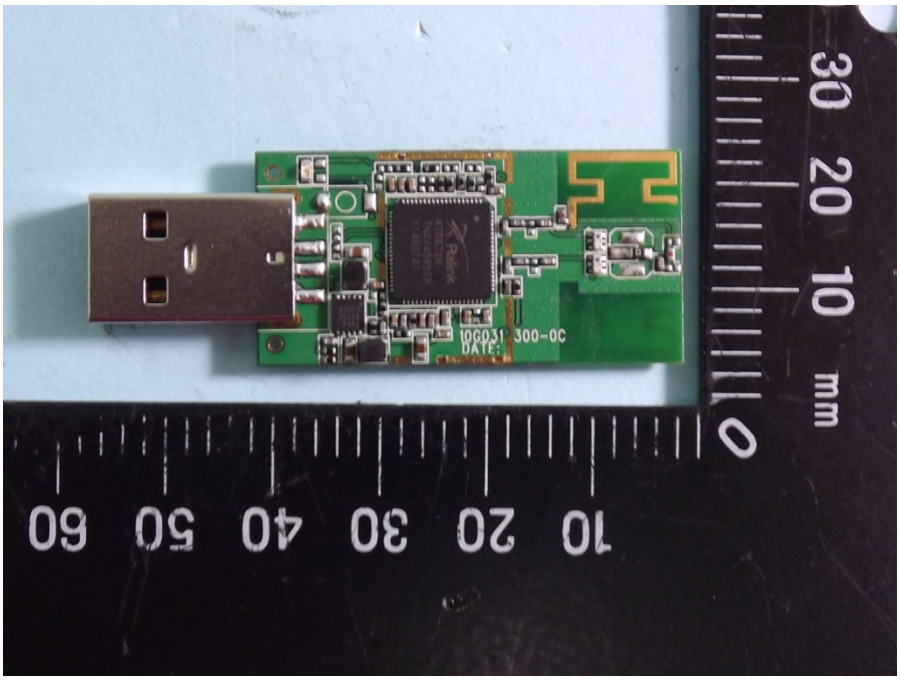
EUT take a close-up.

FRONT VIEW

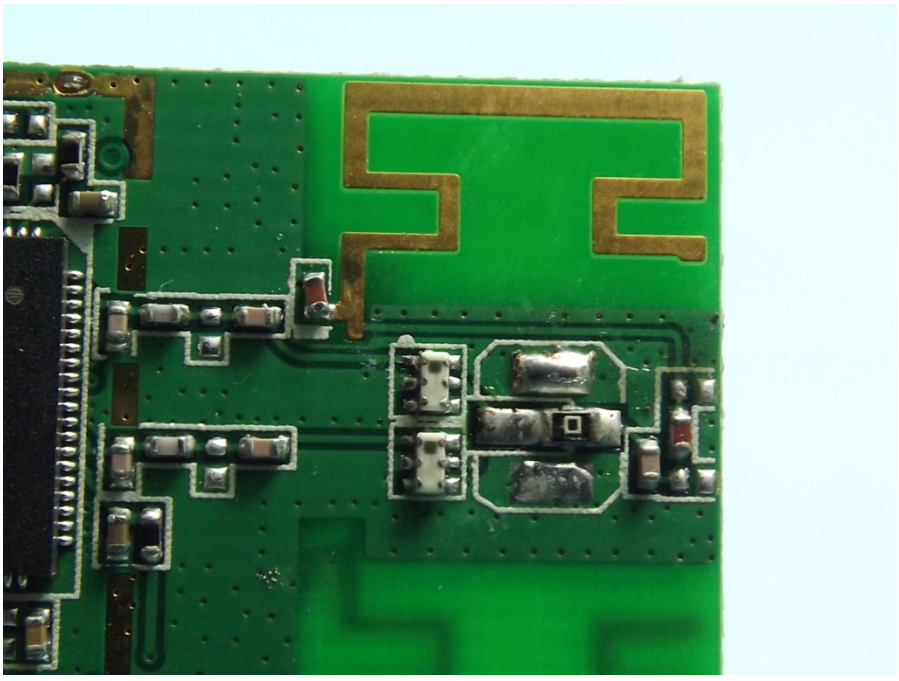
APPENDIX C. Photographs of EUT

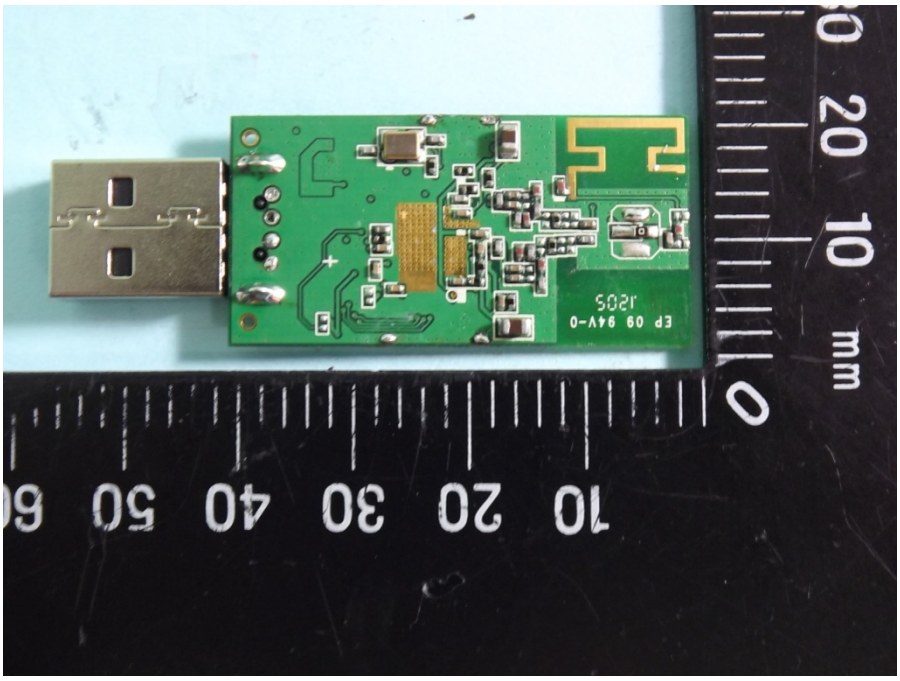
Printed Ant. +USB

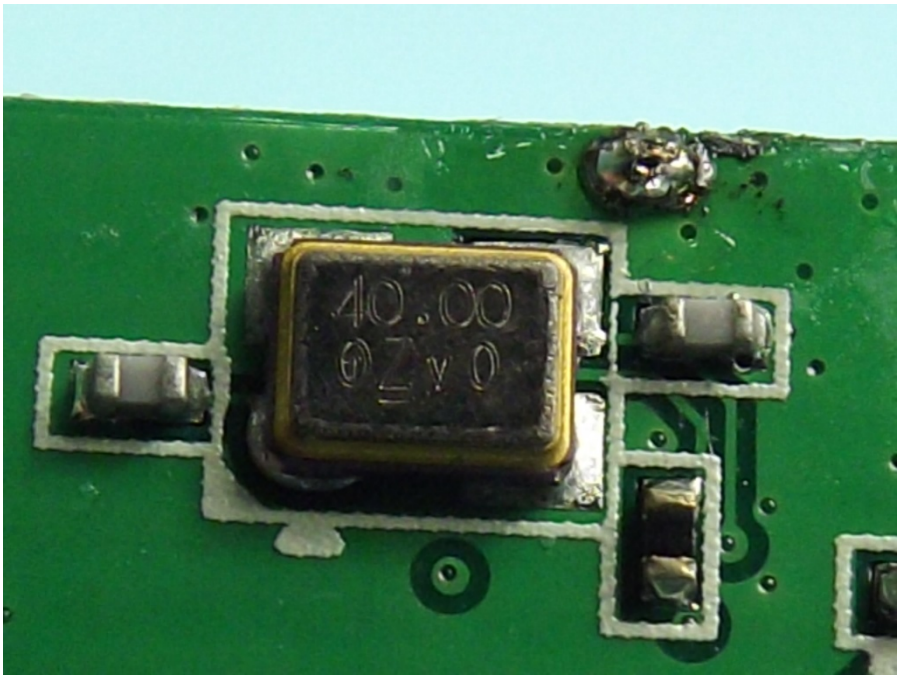


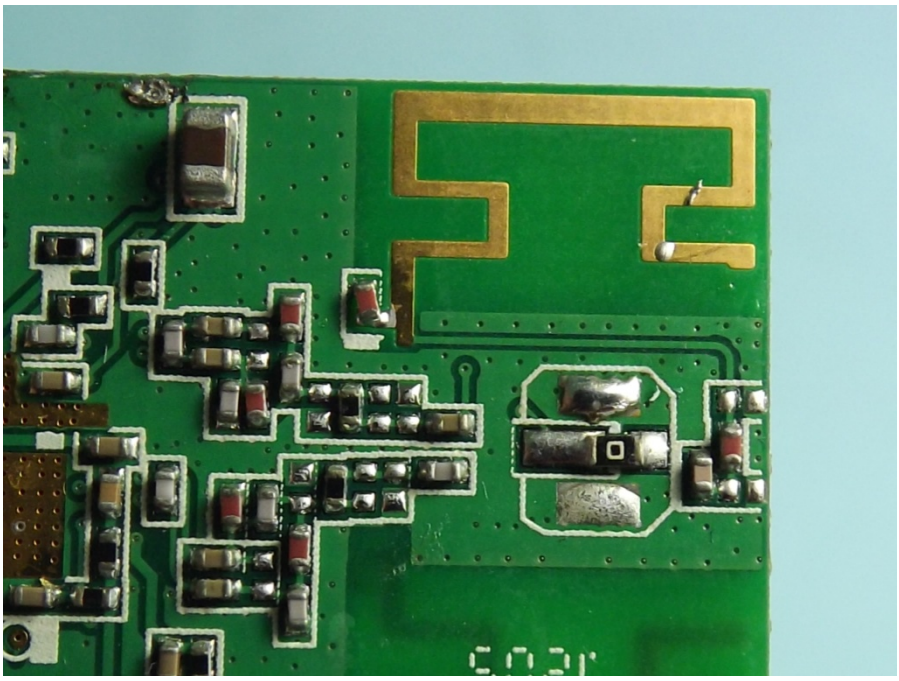


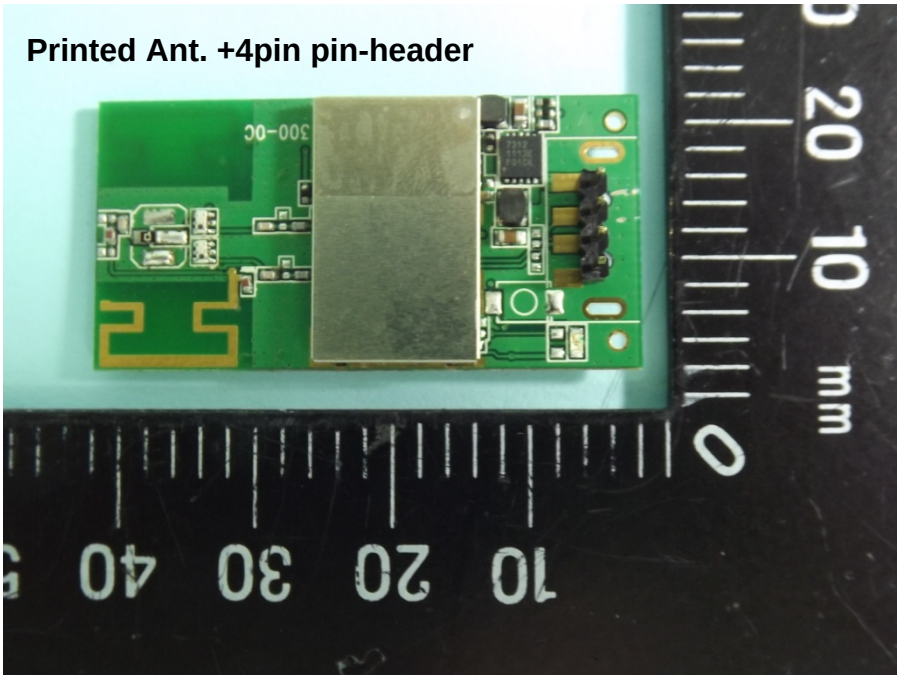

Ralink
RT5572N
TNAV458509
1148STA1

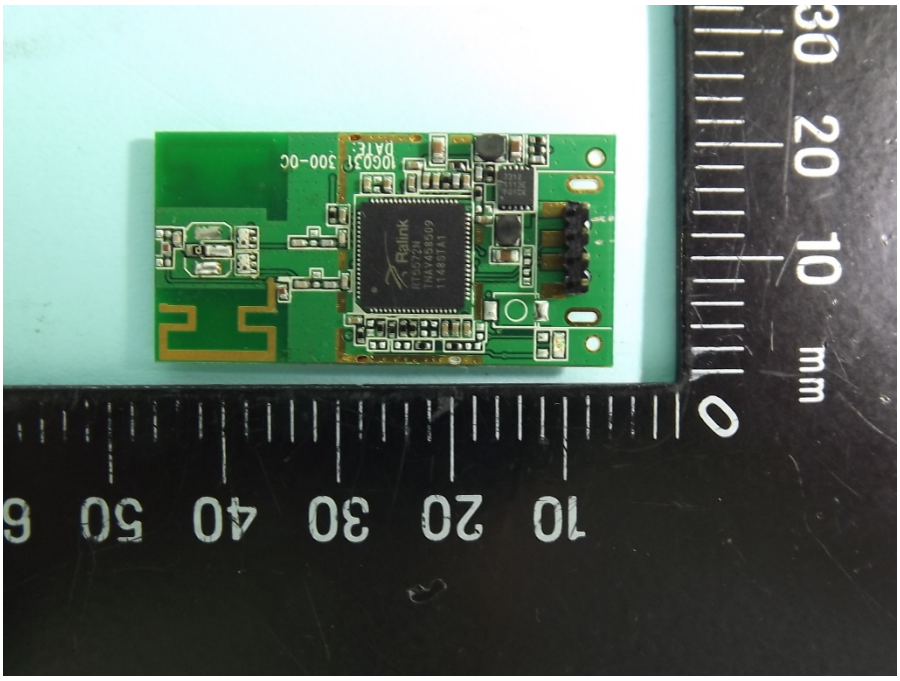



0 20 10 mm
10 20 30 40 50 6
EP 09 94V-0
J205

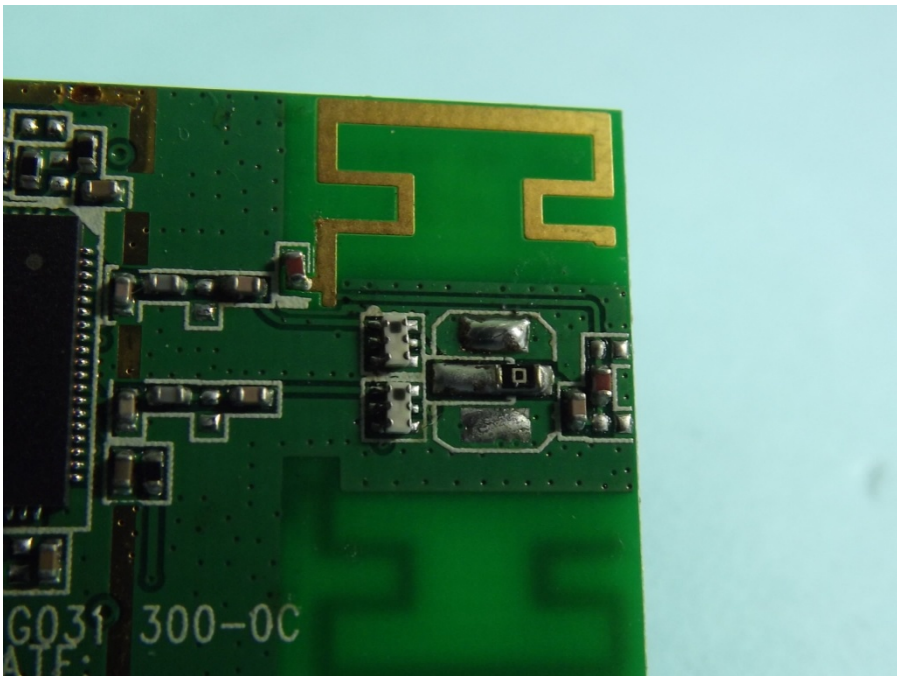

40.00

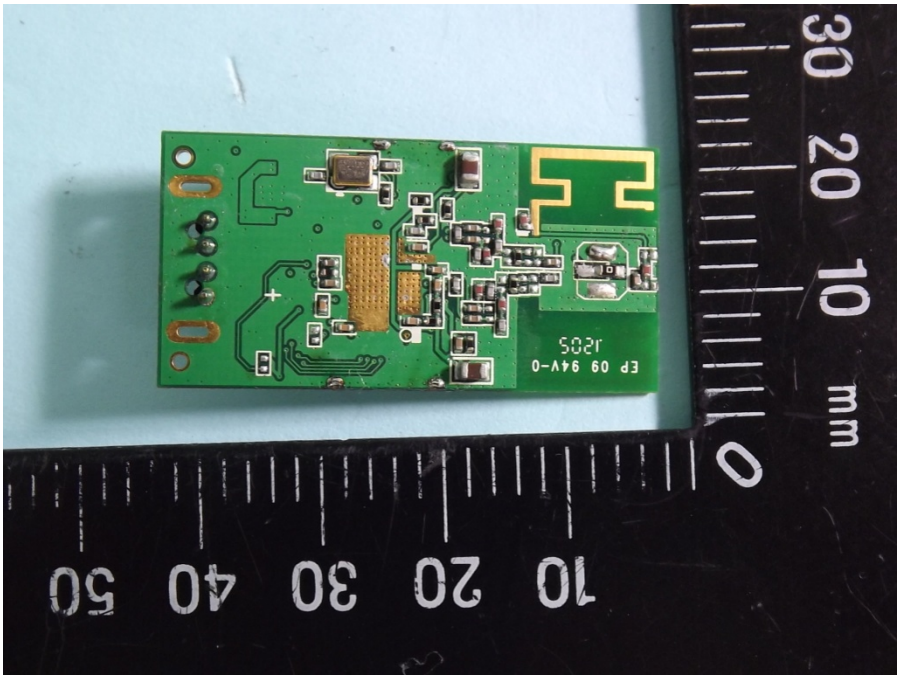



Printed Ant. +4pin pin-header
mm


30 20 10 mm
10 20 30 40 50


Ralink
RT5572N
TNAV458509
1148STA1
10G031
DATE:


300-0C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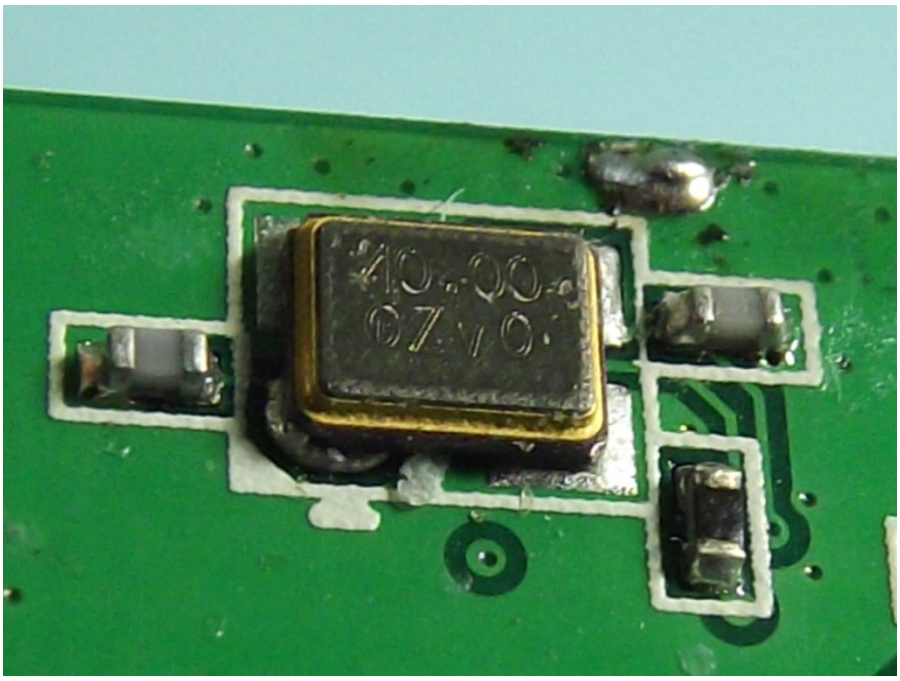
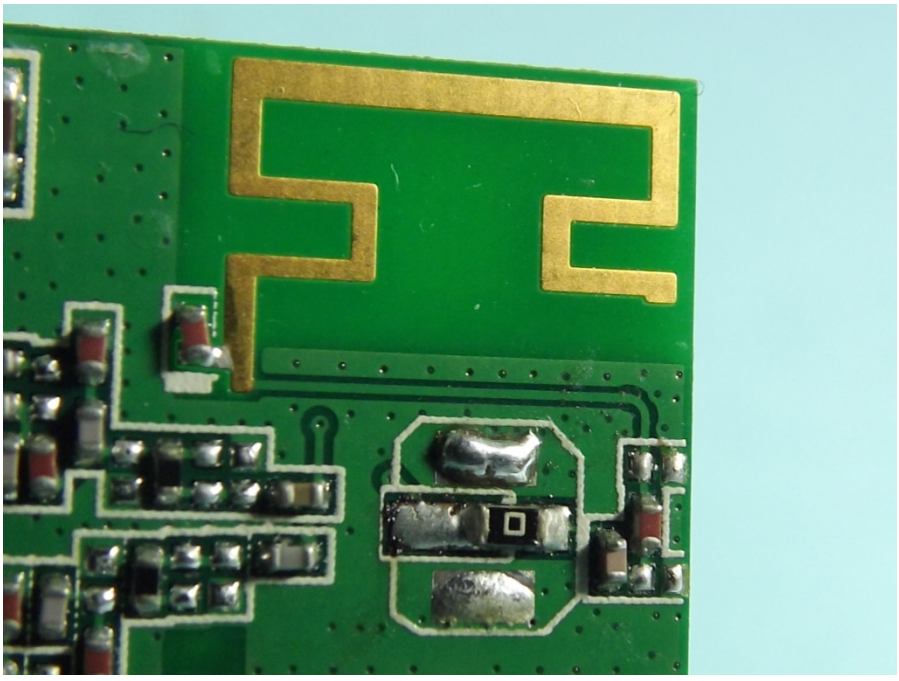
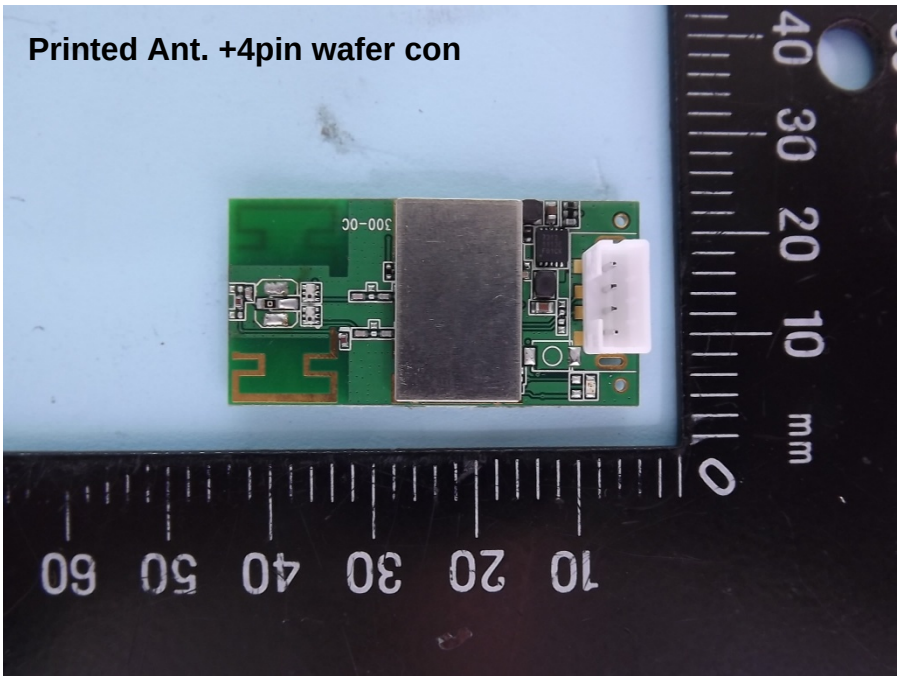
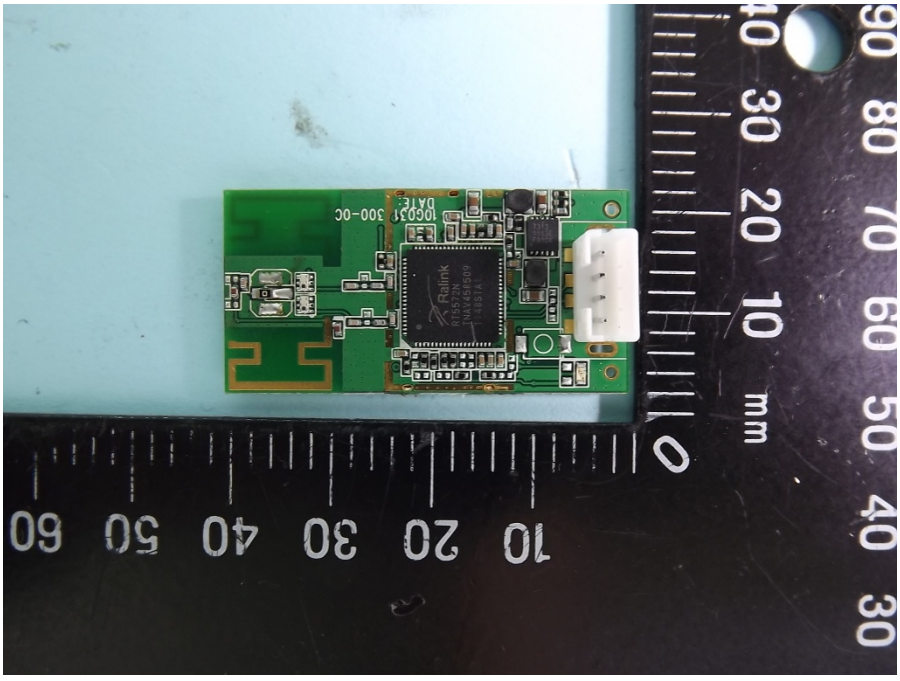
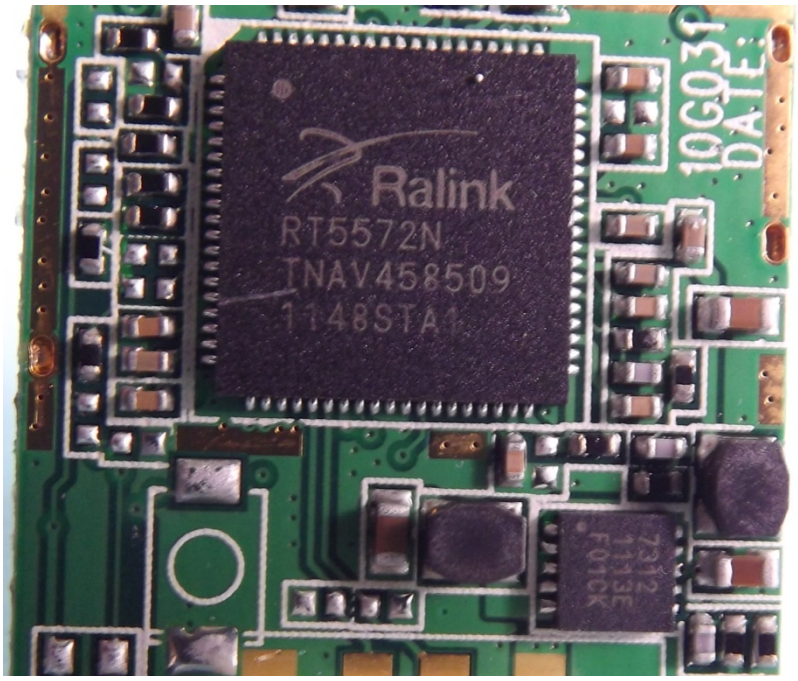
10 20 30 40 50

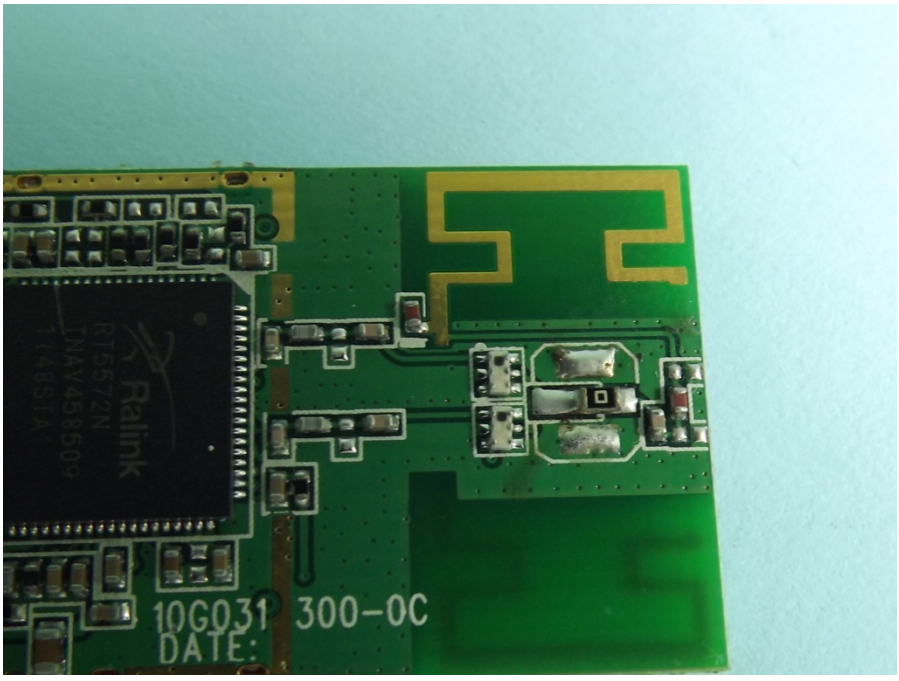


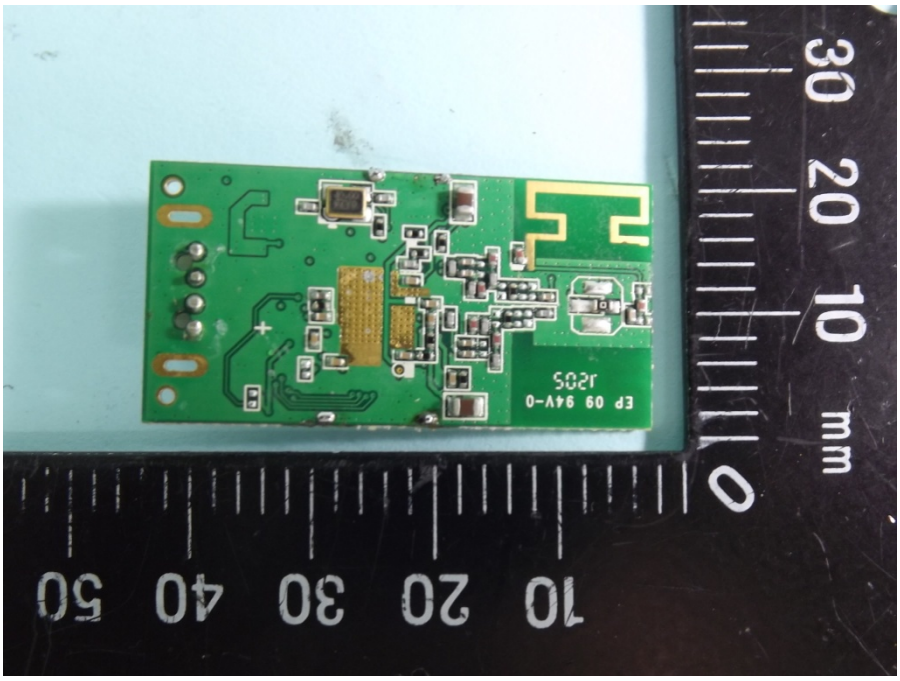


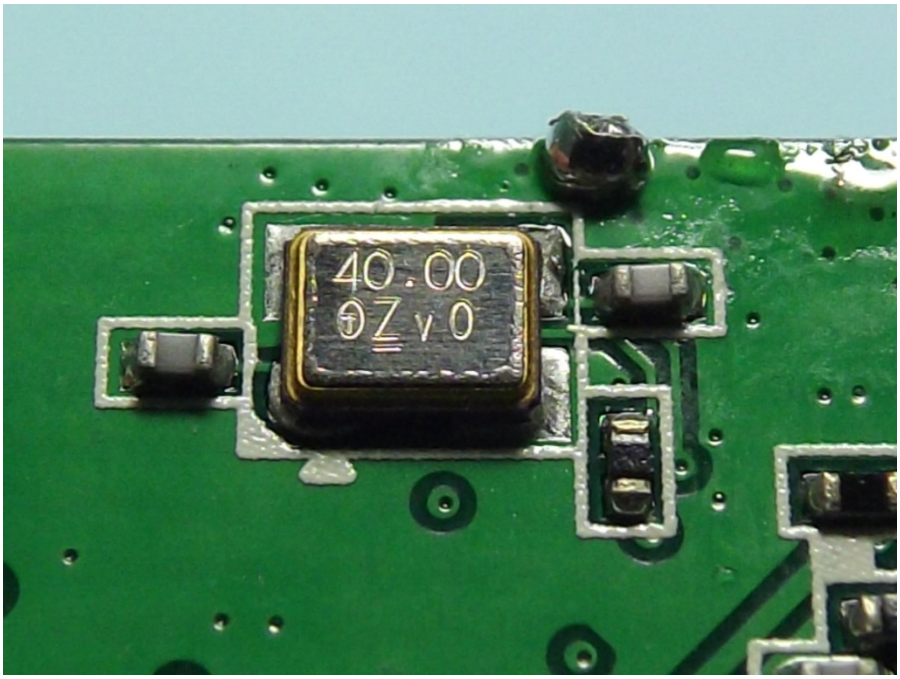

Printed Ant. +4pin wafer con




Ralink
RT5572N
INAV458509
1148STA1
10G031
DATE:


10G031 300-0C
DATE:


30 20 10 mm 0
10 20 30 40 50


40.00